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# Solid Waste Management Alternatives for Teller County, Colorado: A Technical Assistance Panels Program Report

Fred C. Hart Associates, Inc.
Denver, CO

Prepared for

Environmental Protection Agency
Denver, CO

Feb 82

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# SOLID WASTE MANAGEMENT ALTERNATIVES FOR TELLER COUNTY, COLORADO:

## A TECHNICAL ASSISTANCE PANELS PROGRAM REPORT

Prepared for:

U.S. Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80295

Prepared by:

Fred C. Hart Associates, Inc.
Market Center
1320 17th Street
Denver, Colorado 80202

February, 1982

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i.a

Public Law 94-580 - October 21, 1976

Technical assistance by personnel teams. 42 USC 6913

## RESOURCE RECOVERY AND CONSERVATION PANELS

SEC. 2003. The Administrator shall provide teams of personnel, including Federal, State, and Local Employees or contractors (hereinafter referred to as "Resource Conservation and Recovery Panels") to provide technical assistance on solid waste management, resource recovery, and resource conservation. Such teams shall include technical, marketing, financial, and institutional specialists, and the services of such teams shall be provided without charge to States or local governments.

This report has been reviewed by the Project Officer, EPA, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Project Officer: William Rothenmeyer, EPA Region VIII

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# SOLID WASTE MANAGEMENT ALTERNATIVES FOR TELLER COUNTY, COLORADO

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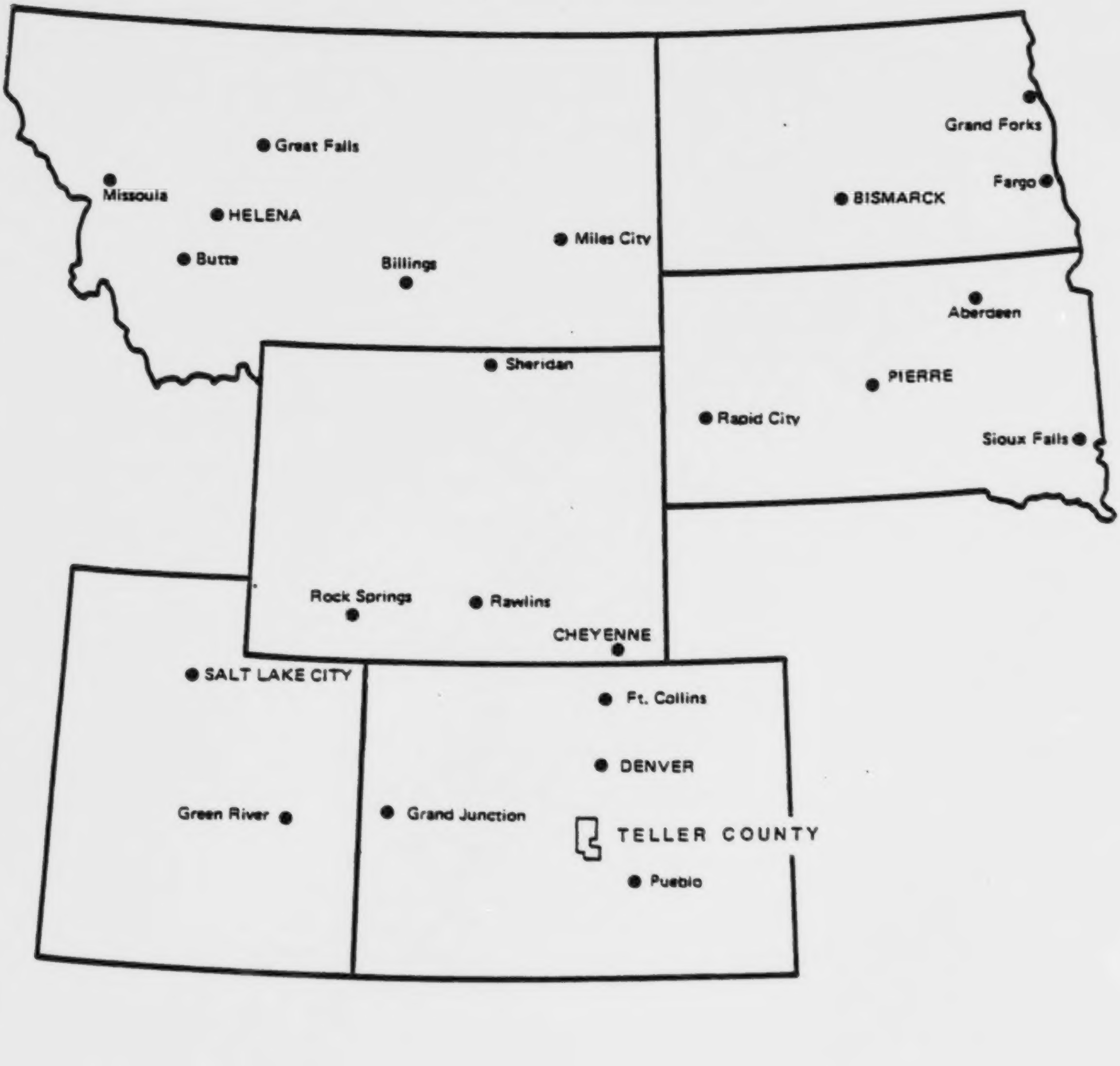
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1320 17th Street
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16. ABSTRACT

Teller County exhibits solid waste management problems similar to many rural mountainous areas in the western United States. The County experiences relatively rapid population growth, a large seasonal influx of summer residents and tourists, and a severe winter climate.

The County requested an analysis of alternative solid waste management systems, including the use of one or more sanitary landfills in the County, hauling waste out of the County in collection vehicles, and transfering waste out of the County after compaction in a transfer station. Cost estimates were developed for the various waste collection, transfer, and disposal alternatives.

Potential landfill sites were located and rated using a quantative review methodology. Such siting factors as soil depth and type, ground and surface water impacts, haul distance, access, size of the site, slope, visibility, and adjacent land use were incorporated into the evaluation system.

The report recommends upgrading of a present County disposal site (Cripple Creek) for use as a sanitary landfill, and closure of the second County disposal site (Victor). It is also recommended that the most suitable of the potential landfill sites be purchased for future development. Continued transfer of some waste out of the County remains a viable alternative contingent upon the continued availabitity of landfill sites in a neighboring county to the east.

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|---|---|---|
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# I. EXECUTIVE SUMMARY

Teller County requested assistance from the U.S. Environmental Protection Agency to establish a solid waste management program. The development of such a program would help the County promote cost effective and environmentally sound solid waste collection and disposal practices. For Teller County, the following alternatives were analyzed: utilizing a single County landfill, using two County landfills (one in the north and one in the south), hauling waste out of the County in collection vehicles, and transferring waste out of the County following compaction at a transfer station. The role of the County's two existing private solid waste collection services was closely examined in the analyses of the above mentioned alternatives.

Cost estimates developed for the various collection and disposal alternatives indicated that the annual cost of a single County landfill compared favorably to the annual costs of the two solid waste "transfer" options analyzed (collection vehicle and transfer station). The cost involved with the operation of a single County landfill would range from $52,100, to $75,900 a year depending on the site and landfilling method chosen. In this report, four potential County landfill sites were identified in addition to the Cripple Creek disposal site (currently operating). In comparison to the annual cost of a single County landfill, the annual costs for the collection vehicle and transfer station options would be $73,400 and $70,000, respectively. The operation of two County landfills was the most expensive alternative studied with anticipated costs ranging from $80,600 to $92,700 a year. All of the above mentioned options would provide residents of the County with nearly equal levels of service.

The study further determined that the continued transfer of waste out of the County will remain a viable alternative contingent upon the continued availability of landfill sites in El Paso County to the east. The advantage of such a system is particularly evident for the northern half of the County where haul distances to disposal sites in El Paso County are relatively short, a collection vehicle "transfer" system presently operates, and no landfill currently exists.

The Cripple Creek disposal site in southern Teller County can be upgraded for use as a sanitary landfill for the residents in that area. Burning practices should be discontinued and existing and future waste should be properly spread, compacted, and covered at the Cripple Creek site if the site is to be operated efficiently and safely. The future operation of the Victor disposal site was not recommended due to the serious potential for surface water pollution, and the safety hazards associated with inadequate cover and fencing, and burning and blowing trash.

It was additionally recommended that the most suitable of the four potential landfill sites be purchased for future use. Because of the rapid consumption of land for development purposes, areas in the County that might be suitable for a landfill will become unavailable if not set aside in the near future. The acquisition of this land will reduce the dependency on disposal sites outside the County and will in general preserve the Teller County landfill option for the future when other disposal alternatives (like transfer) become much more limited in feasibility.

# II. INTRODUCTION

## A. Project Background

Teller County, Colorado, has experienced recurring difficulty in its efforts to establish a long-term, environmentally sound solid waste management plan. Several of the factors affecting the County's solid waste system are a relatively small, dispersed, but rapidly growing population, a large seasonal influx of tourists and summer residents, rapid land development, mountainous topography, and a severe winter climate.

Currently, waste is collected by private haulers or transported by private individuals, and is disposed of at the two existing Teller County disposal sites, or is transferred to El Paso County for disposal. According to a 1980 inspection performed by the Colorado Department of Health (CDH), the existing disposal sites at Cripple Creek and Victor display hazards to public health and the environment. Such problems as the potential for serious surface or ground water pollution, the presence of safety hazards, odors, and vectors, a lack of adequate fencing and cover, and the practice of uncontrolled burning are cited as the basis for recommendation of closure of the sites.

The problems mentioned above must be solved if the County is to institute a solid waste management system which will serve the public safety and the environment and comply with CDH and U.S. Environmental Protection Agency (EPA) standards (see Appendix A for CDH regulations). If use of the Cripple Creek site is to continue, extensive measures, including surface water diversion, adequate cover, and fire control, must be taken to mitigate negative impacts. The Victor site does not appear to be operable as a sanitary landfill because of the physical layout of the site which has contributed to the serious problems cited above. Other options include the siting and development of new landfill sites, and/or the siting and development of transfer stations, for accumulation of waste prior to its transportation to a landfill site inside or outside of the County.

Teller County requested technical assistance for a solid waste disposal study from the Region VIII Office of the EPA in Denver, Co., in the early part of 1981. The County's request was granted, and the EPA regional office authorized its technical assistance consultant, Fred C. Hart Associates, Inc., to provide specific solid waste management services. The consultant was directed to evaluate and develop cost estimates for various disposal and transfer alternatives, and to provide detailed recommendations as to the most appropriate method of implementation.

## B. Scope of the Study

Several key issues will be evaluated in this study to aid Teller County in promoting cost effective and environmentally sound solid waste collection and disposal practices. Initially, present and future population and waste generation estimates will be prepared, including estimates of seasonal changes in the amount of waste produced. Existing solid waste practices and their costs are to be surveyed. The long-range changes affecting solid waste management in Teller County will be considered, including such possibilities as the closure of sites in Colorado Springs presently used by County residents, the effect of rising energy costs, the potential for operation of joint facilities with Park County, and the special problems caused by rapid population growth.

Another phase of the study is the identification of three to five potential sanitary landfill sites in the County, which will comply with Federal and State regulations. The suitability of the sites is to be evaluated, considering such factors as the potential for surface and ground water contamination, availability of cover material, area (size) of the site, fire danger, compatibility with adjacent land uses, slope, haul distance, accessibility, and the necessity of screening. A cost estimate for each site, including purchase of the land, site development, and landfill operational expenses will be prepared.

An additional task is the completion of an itemized cost analysis, comparing the option of landfilling the wastes in the County with the options of moving waste out of the County in individual collection vehicles, or removal out of the County in roll-off containers after compaction at a transfer station. The comparison will determine the difference in cost if the total county is involved, or if the northern part of Teller County (basically encompassing the Woodland Park, Florissant and Divide areas), is considered exclusively (see Figure 1). The majority of the County's waste is generated in the northern part of the County.

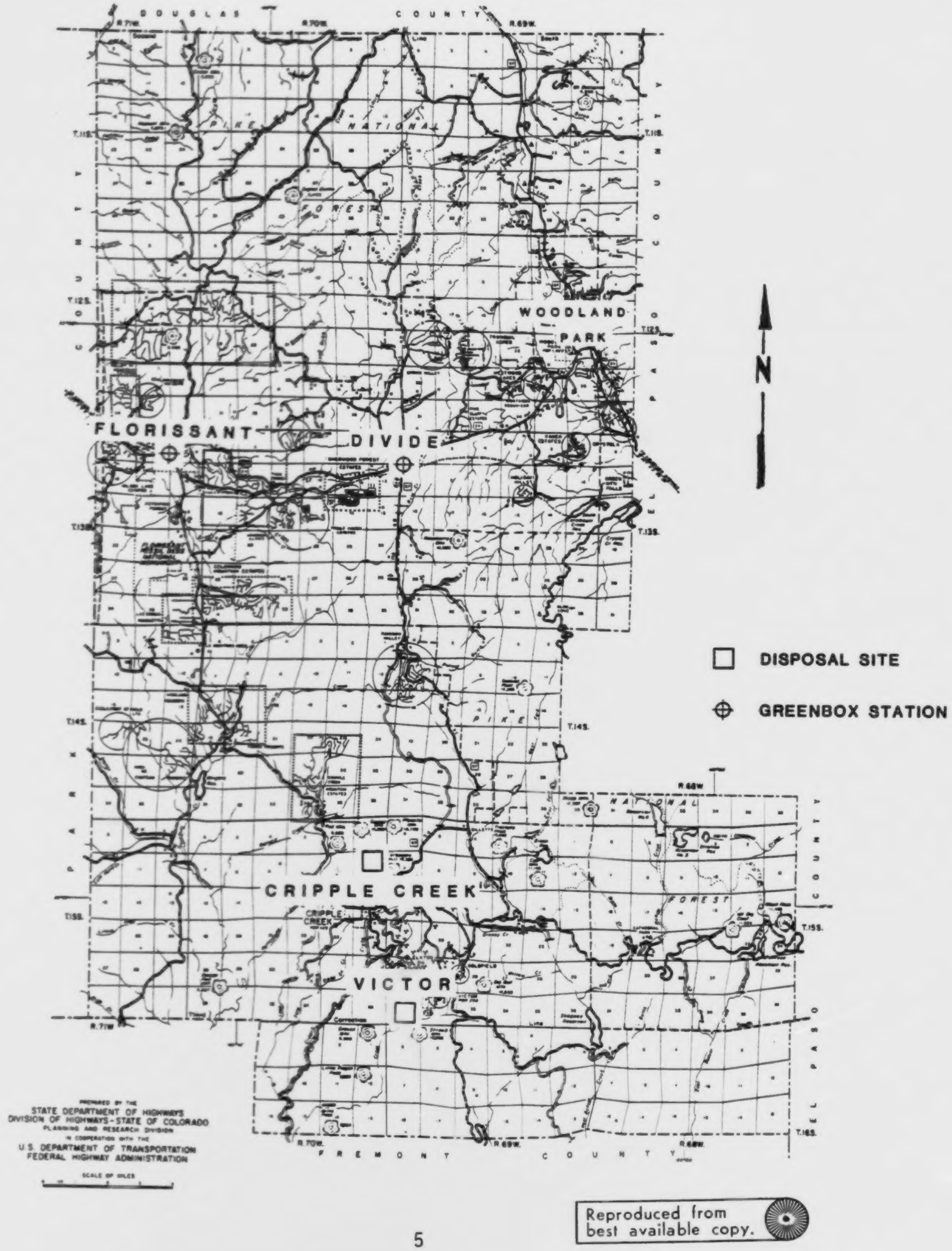
Specific suggestions for improving collection and disposal practices in Teller County are to be provided, as well as recommendations concerning the future utilization of the present Cripple Creek and Victor disposal sites. The potential for recycling, including waste oil and white goods, is also to be analyzed.

Detailed guidance for the implementation of a transfer station and of a sanitary landfill will be prepared. Equipment requirements, operational procedures, staffing requirements, and proposed rules for operation for both alternatives shall be included.

Finally, the options available for financing solid waste improvements will be summarized, incorporating an investigation of the availability of Federal or State aid.

FIGURE 1

TELLER COUNTY STUDY AREA


DOUGLAS COUNTY
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R.70W.
R.69W.
R.68W.
T.11S.
T.12S.
T.13S.
T.14S.
T.15S.
T.16S.
PIKE NATIONAL FOREST
WOODLAND PARK
FLORISSANT
DIVIDE
CRIPPLE CREEK
VICTOR
PARK COUNTY
EL PASO COUNTY
FREMONT COUNTY
N
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## C. Description of the Study Area

Teller County is located in central Colorado, in the Front Range of the Rocky Mountains. Pikes Peak dominates the area topographically, on the County's west central border. Park, Jefferson, Douglas, El Paso, and Fremont counties are adjacent, and Colorado Springs, 18 miles to the east, is the nearest metropolitan area. The study area encompasses a total of 554 square miles, with a maximum north-south dimension of approximately 34 miles, and a maximum east-west dimension of 22 miles. The Platte-Arkansas Divide results in the drainage of the northern portion of the County into the South Platte River, while the southern portion drains into the Arkansas River.

The U.S. Forest Service and, to a lesser extent, the Bureau of Land Management, administer the 43 percent of federal land in the County. Municipal and County governments control 2 percent, the State of Colorado owns 2 percent, and 53 percent of the land is privately owned.

The County's economy is based on tourism, mining, and land development. Privately held land is primarily used for grazing or light agricultural practices, and the building of second homes. Mining development (cyanide leaching of gold) is occuring, with approximately 20 mining permits issued in the past year. The newly constructed Texas-Gulf cyanide leaching facility, located near Cripple Creek, will contribute to the County's mining industry.

County governmental services are located in Cripple Creek, the County seat, and in Woodland Park. Three elected commissioners oversee the funding and management of County services.

**Climate.** The climate of the area is typified by low precipitation and low mean temperatures. Specific microclimates are caused by wind patterns, relief, and elevation (modified by gradient and slope aspect). A climatological data summary, from a Cripple Creek weather station (no longer in operation) for the years 1951-1960, indicates a mean annual temperature of 39°F and a mean annual precipitation of 14.2 inches (see Table 1). Summer precipitation may be 6 to 8 times more than the total amount of winter precipitation. It is estimated that approximately 75 percent of the precipitation occurs from April through October, and June is the driest summer month. Many areas in Teller County experience snowfall with wind-driven snow drifts up to 15 feet deep. Average annual snowfall is approximately 71 inches for Teller County.

Local wind patterns at the ground level are the result of differences in topography and temperature over the land surface. Wind speeds are relatively high. Winds generally blow from the north-northwest, or from the south-southeast.

## TABLE 1

## CLIMATOLOGIC DATA SUMMARY FOR TELLER COUNTY*
## CRIPPLE CREEK WEATHER STATION, 1951-1960

| Month | Mean Temperature (°F) | Total Precipitation (Inches) |
|---|---|---|
| January | 22.4 | .34 |
| February | 22.2 | .48 |
| March | 26.5 | .89 |
| April | 35.3 | 1.52 |
| May | 43.7 | 1.82 |
| June | 52.2 | .90 |
| July | 58.2 | 3.63 |
| August | 58.0 | 1.95 |
| September | 51.7 | .92 |
| October | 41.7 | .75 |
| November | 31.5 | .59 |
| December | 24.9 | .41 |
| MEAN ANNUAL | 39.0 | 14.20 |

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* Source: U.S. Weather Bureau (1).

**Geology.** Teller County is almost entirely underlain by the crystalline igneous rocks of the Pikes Peak Batholith. The predominant rock unit is Pikes Peak granite, composed primarily of feldspar and quartz, with minor amounts of biotite mica and/or hornblende. It is a massive, pink to reddish, medium to coarse-grained rock mass that weathers readily to a gravelly sand. Some Quaternary alluvium and colluvium and older conglomeritic sandstone deposits are also present.

Geologic hazards such as landslides, rockfalls and soil erosion may be encountered, due to steep slopes. The area surrounding Cripple Creek has experienced moderate to intense mining disturbances, due to underground gold mining near the surface. Innumerable prospect pits, dozens of small shafts, and approximately a dozen large mines (some still in operation) are located throughout the area.

**Soils.** The nature of soils in Teller County is primarily determined by the parent material and local topography (slope gradient and aspect). The predominant parent material (85-90 percent) is Pikes Peak granite in place, and alluvial and colluvial materials from the weathering of the granite. Pikes Peak granite has a coarse, granular texture, which causes it to weather easily. However, due to steep topography in Teller County, and the low ability of the soil to hold water, chemical weathering has been minimal, and the resulting soils are thin or poorly developed. The soils are very gravelly and susceptible to gully erosion. Recent roadcuts expose up to several feet of coarse-textured, disintegrated granite.

On less steeply sloping areas, and on finer-textured sediments, soils are moderately deep to deep. When slope aspect is north or west-facing, the resulting heavy forest and understory growth have led to the development of moderately deep forest soils. Specific soils will be discussed further in Section IV, concerning potential sanitary landfill site evaluation.

The climate, soils, and geology of an area directly affect solid waste collection and disposal operations. The proper operation of a sanitary landfill can be curtailed by freezing temperatures (causing cover material to be unworkable), deep snows, and high winds. Insufficient supplies of cover material, due to shallow soil depth or an unsuitable soil type, can also hinder landfill operations. The proper siting of a landfill is limited by a shallow depth to ground water and bedrock (to be discussed in Chapter IV) and topography (e.g., steep slopes), as well as other factors.

# III. POPULATION AND WASTE GENERATION

## A. Population

**Permanent Population.** Table 2 lists the current and projected population figures for Teller County. The U.S. Bureau of the Census separates Teller County's population into two separate census divisions, Tract/Block Numbering Areas 101 and 102 (see Figure 2). Tract/Block Numbering Area 101 encompasses roughly the northern half of the County including Woodland Park and Florissant (unincorporated) and Tract/Block Numbering Area 102 contains the southern half of the County, including Cripple Creek and Victor.

The 1980 Census estimated a population of 8,034 people (see Table 2). This represents a total increase of 142 percent over the 1970 population of 3,316 people. According to figures calculated by the Demographic Section of the Colorado Department of Local Affairs, Teller County was the second fastest growing county in the Colorado Front Range over the previous decade (Douglas County was the fastest). Population projections developed by the Department of Local Affairs for a high population growth scenario point to a 58 percent increase in the 1980 population over the next ten years. By the year 1990, projections suggest a Teller County population of 12,700. The annual rate of population increase is expected to slow to 4.7 percent which is nearly half the 9.2 percent annual growth rate experienced during the period between 1970 and 1980.

Over the next ten years, projections indicate a 51 percent increase in the population of Woodland Park, a 38 percent increase for Cripple Creek, and a 30 percent increase for Victor. In Teller County, the largest expansion will occur in the unincorporated areas, especially around Woodland Park and Florissant.

**Seasonal Population.** Seasonal residents, defined as persons who make Teller County their home for six months or less each year (and therefore are not included in the Census figures for Teller County), constitute a large percentage of the County's summer population. However, no exact count has been taken of their numbers.

Therefore, the estimate of the seasonal population must be derived from data which does exist; namely, the number of seasonal housing units in the County and the average number of people per housing unit (data supplied by the U.S. Bureau of the Census). In 1970, approximately 17 percent of all County housing units were listed as seasonal and migratory. A similar but slightly increased percentage of 20 percent for 1980 was used for estimations, as local sources indicate that the percentage of seasonal and migratory units has increased slightly. Out of 5,100 total housing units, approximately 1,020 can be considered seasonal. Using the 1980 Teller County average of 2.8 people per housing unit, it is estimated that there are approximately 2,900 seasonal

## TABLE 2

## CURRENT AND PROJECTED POPULATION
## TELLER COUNTY, COLORADO*

| Area | 1980 Population | Projected 1990 Population | Percent Increase |
|---|---|---|---|
| Tract 101 | | | |
| Woodland Park (city) | 2,634 | 3,980 | 50% |
| Green Mountain Falls (town) | 18 | 18 | 0% |
| Unincorporated Areas | 4,161 | 6,949+ | 67% |
| Subtotal | 6,813 | 10,947 | 61% |
| Tract 102 | | | |
| Cripple Creek (city) | 655 | 905 | 38% |
| Victor (city) | 265 | 345 | 30% |
| Unincorporated Areas | 301 | 503+ | 67% |
| Subtotal | 1,221 | 1,753 | 44% |
| Total County | 8,034 | 12,700 | 58% |

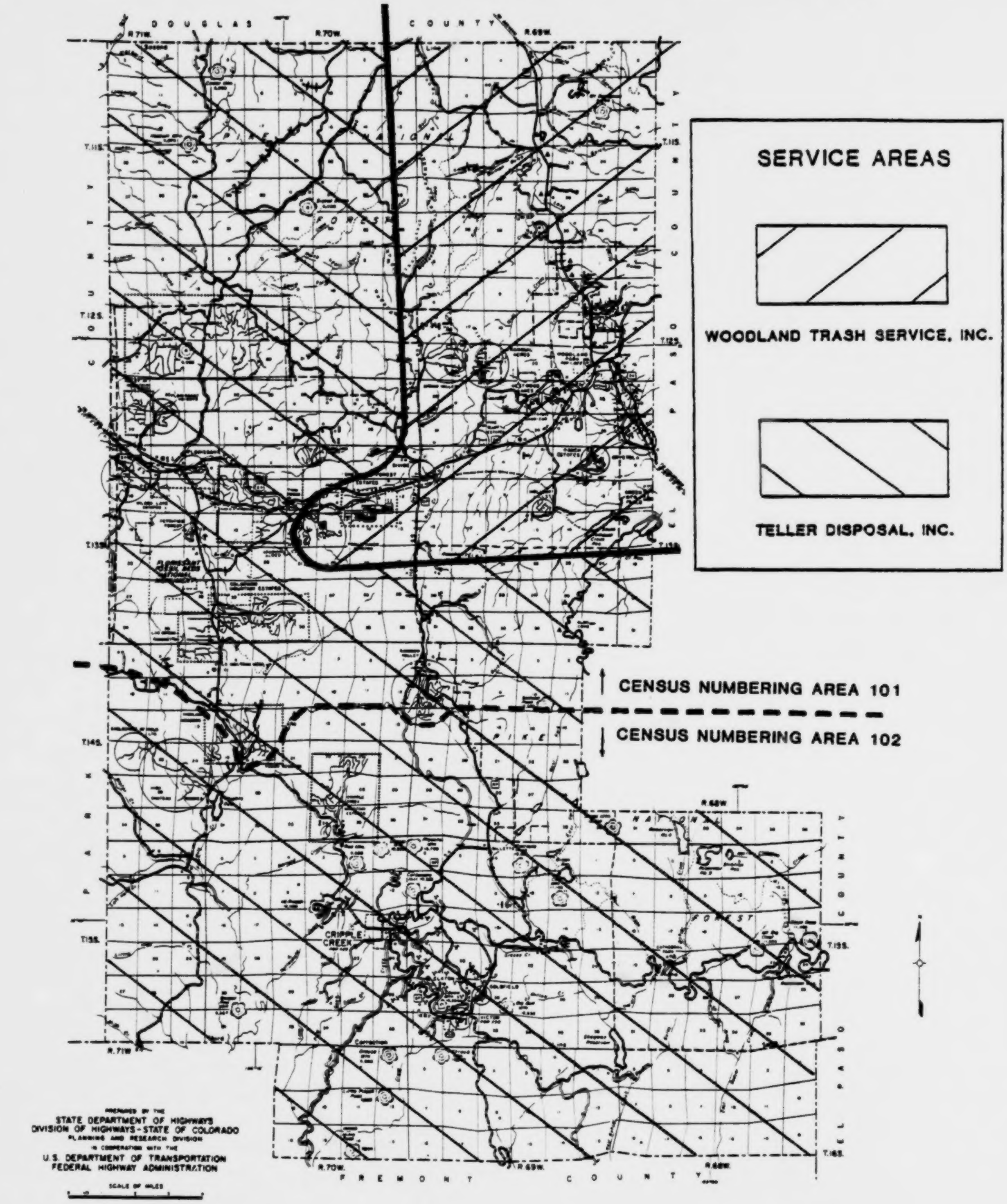
---

* Source: U.S. Bureau of the Census (2)

+ The Colorado Department of Local Affairs did not provide 1990 population projections for the unincorporated areas of Teller County. However, the Department projected a 58 percent increase in population for the entire county, with the majority of the increase occurring in the unincorporated areas. Therefore, the 1990 projected populations for the unincorporated areas of Tracts 101 and 102 were developed by ratioing the unincorporated areas populations upwards based on the 1980 percentage of population in the unincorporated areas.

# FIGURE 2

# TELLER COUNTY CENSUS AND WASTE COLLECTION SERVICE AREAS


DOUGLAS COUNTY
R.71W.
R.70W.
R.69W.
R.68W.
T.11S.
T.12S.
T.13S.
T.14S.
T.15S.
T.16S.
PIKE NATIONAL FOREST
CRIPPLE CREEK
PARK COUNTY
EL PASO COUNTY
FREMONT COUNTY
SERVICE AREAS
WOODLAND TRASH SERVICE, INC.
TELLER DISPOSAL, INC.
CENSUS NUMBERING AREA 101
CENSUS NUMBERING AREA 102
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residents. Most summer homes in Teller County are distributed in the broad unincorporated areas around Woodland Park and the Florissant Fossil Beds National Monument. Conversations with County officials and private citizens in Teller County indicate that the total number of seasonal housing units can be divided equally between these two areas.

## B. Current Waste Volumes

To formulate an efficient solid waste management plan for Teller County, current solid waste volumes must be estimated for the ten-year study period. Because detailed data on existing waste generation sources, rates, and composition are not available, a per capita waste generation rate was derived to define the current and projected municipal waste volumes for the permanent and seasonal population . The volume of tourist-produced waste (by seasonal visitors to the Cripple Creek/Victor area and the Florissant Fossil Beds National Monument) and bulky waste was estimated using previously developed waste generation rates. The amount of waste generated on U.S. Forest Service facilities north of Woodland Park was approximated using figures provided by the U.S. Forest Service. Information on the volume of waste generated is needed for, among other things, the proper sizing of landfill and transfer equipment, determining the amount of land and cover necessary for a landfill, and for formulating the proper method, operational plan, and cost of disposing of the waste.

Municipal (non-bulky) waste volumes were analyzed for the service areas of the County's two private waste haulers, Woodland Trash Service (serving the northern half of the County, excluding the Florissant area), and Teller Disposal, Inc. (serving the southern half of the County including the Florissant area) (see Figure 2). Waste volumes generated outside of Teller County but within the service areas of these two haulers were not analyzed. Yardage figures were supplied by Woodland Trash Service for its service area and were used to derive a per capita waste generation rate that could be applied to permanent and seasonal residents of the entire County.

**Waste Volumes in the Woodland Trash Service Area.** Woodland Trash Service was able to provide waste yardage (compacted) figures for its service area for 1980 and the first five months of 1981. The information supplied contained the amount of municipal waste generated by both the area's permanent and seasonal residents. These figures included the residential and commercial wastes collected from door-to-door pick-up by Woodland Trash and wastes collected by Woodland Trash at the Divide greenbox stations.

These initially reported compacted waste yardage figures were converted to uncompacted figures through a simple multiplication process based on the compaction ratios of the collection vehicles. Woodland Trash operates two such vehicles with each truck handling approximately fifty percent of the service area. The older of the two trucks compacts waste to a 4:1 ratio whereas the newer truck compacts to a 7:1 ratio. As an example of this transformation, a 40 cubic yard volume of uncompacted waste can be compressed into 10 cubic yards of compacted waste if the collection vehicle operates at a 4:1 compaction ratio. For the 515-day period of record, approximately 53,300 cubic yards of uncompacted waste were generated in the Woodland Trash service area in northern Teller County.

Twenty percent of the waste collected was excluded from northern Teller County's waste production because Woodland Trash collects approximately this percentage out of the County, primarily in El Paso County to the east. Only ten percent of the waste was eliminated from the Teller County figure for the months between August, 1980 and May, 1981. This is a result of the loss of ten percent of Woodland Trash's customers in El Paso County in August, 1980. Due to the deregulation of the waste hauling industry by the Colorado Public Utilities Commission at that time, competition from a private hauler in El Paso County resulted in the loss of customers in that portion of Woodland Trash's operating area.

Approximately 800 people in northern Teller County are not utilizing the services of the Woodland Trash or the Divide greenbox station (collected by Woodland Trash). These people are located in and around Florissant and use the Florissant greenbox station. These 800 people were subtracted from the total population figure for northern Teller County (Tract/Block Numbering Area 101) to obtain the 6,000 population figure used below.

Data supplied by Woodland Trash Service indicate that approximately three pounds per person per day are currently being produced by the permanent and seasonal residents in Woodland Trash's service area in Teller County. This waste generation rate is comparable to the national average per capita waste generation figures for rural areas.

With a permanent population of 6,000, a 120-day seasonal population of 1,500 (which converts to 490 a year), a waste density of 175 pounds per cubic yard (uncompacted), and a 53,300 cubic yard waste production for a 515-day period of record, the per capita waste generation calculation is as follows:

$$\frac{53{,}300 \text{ yd.}^3 \times 175 \text{ lbs./yd.}^3}{6{,}490 \text{ persons}} \div 515 \text{ days}$$

$$= 2.8 \text{ lbs./person/day}$$

For the purpose of this report this figure was rounded to three pounds per person per day.

The northern Teller County generation rate can be used in conjunction with census figures to calculate waste volumes County-wide. Using this three pounds per person, per day rate, approximately 3,290 tons per year are currently produced by the permanent population in the Woodland Trash service area. The calculation follows:

$$\frac{6{,}000 \text{ persons} \times 3 \text{ lbs./person/day} \times 365 \text{ days}}{2{,}000 \text{ lbs./ton}}$$

$$= 3{,}290 \text{ tons/year}$$

As discussed previously, approximately half of the seasonal Teller County population, or about 1,500 people, are located in Woodland Trash's service area. Using the three pound per day generation rate over a seasonal 120-day period, an estimated 270 tons of waste are produced by this population group per year. The derivation of this figure follows:

$$\frac{1{,}500 \text{ persons} \times 3 \text{ lbs./person/day} \times 120 \text{ days}}{2{,}000 \text{ lbs./ton}}$$

$$= 270 \text{ tons (in 120 days)}$$

Concerning bulky wastes (i.e., stoves, refrigerators, construction debris, tree trunks, auto parts, etc.), a U.S. EPA study reported that in the U.S. bulky wastes comprise aproximately seven percent by weight of the municipal waste stream (3). In Teller County this rate was inflated to ten percent to take into account the large amount of construction debris associated with the rapid population growth. Ten percent of the municipal wastes tonnage (3,560 tons) equals approximately 360 tons/year. This is, therefore, the approximate amount of bulky waste produced by the permanent and seasonal population in the Woodland Trash service area.

The waste yardage collected by Woodland Trash does not include the wastes generated on U.S. Forest Service lands and collected by that agency. In northern Teller County, the U.S. Forest Service collects from its five campground and one picnic area approximately 320 compacted cubic yards over its 120-day tourist season (mid-May to mid-September). Assuming a compaction ratio of 4 to 1 compacted to loose refuse density by weight, and a loose refuse density of 175 pounds per cubic yard, there are currently 110 tons of trash being produced on Forest Service lands annually. The calculation follows:

$$\frac{20\ \text{yd.}^3\ \text{yd} \times 175\ \text{lbs./yd.}^3}{2{,}000\ \text{lbs./ton}} \times 4\ \frac{\text{uncompacted waste}}{\text{compacted waste}} \times 16\ \frac{\text{weeks}}{\text{year}}$$

$$= 110\ \text{tons}$$

Therefore, in the service area of Woodland Trash Service in Teller County, there are currently 3,560 tons of municipal waste and 360 tons of bulky waste being generated by the permanent and seasonal residents of the Woodland Park area, and 110 tons of waste being produced by visitors to the National Forest lands. This totals a current annual waste volume for northern Teller County, excluding Florissant, of 4,030 tons.

**Waste Volumes in the Teller Disposal, Inc. Service Area.** The service area of Teller Disposal, Inc. (see Figure 2) includes the southern half of the County including Cripple Creek and Victor (Victor residents use the Victor dump); the Florissant area (Florissant area residents utilize the Florissant greenbox station), and the Florissant Fossil Beds National Monument. Using the resident waste generation rate calculated for the Woodland Trash service area and the previously developed bulky waste generation rate, the waste volumes produced by the permanent and seasonal residents in Teller Disposal's service area can also be computed. Waste generated by tourist visitors to the Cripple Creek/Victor historic district, and the Florissant Fossil Beds National Monument will be calculated.

According to 1980 census enumeration district figures, 1,221 people inhabit southern Teller County (Tract/Block Numbering Area 102) and approximately 800 people live in the northwestern part of the County around Florissant. Using this total population figure of 2,021 and the waste generation rate of three pounds per person, per day derived above, approximately 1,110 tons of trash are currently produced annually by these permanent residents. This tonnage figure can be calculated as follows:

$$\frac{2{,}021\ \text{persons} \times 3.0\ \text{lbs./person/day} \times 365\ \text{days/yr.}}{2{,}000\ \text{lbs./ton}}$$

$$= 1{,}110\ \text{tons/yr.}$$

As discussed previously, the seasonal population is assumed to be divided equally between the two service area. The seasonal population can again be expected to generate waste at three pounds per persons per day. With 1,500 such residents in the Teller Disposal service area, their contribution to the waste stream would be 270 tons and is calculated as before in the Woodland Trash service area discussion.

Ten percent by weight of the waste stream in the Teller Disposal service area again represents the estimated quantity of bulky wastes in this area. With a municipal waste stream volume of 1,380 tons, the contribution from bulky wastes equals approximately 140 tons.

The volume of waste generated by tourists in this area is a somewhat more elusive figure, due to the lack of reliable data concerning their numbers. Tourism in Teller County is more heavily promoted in, and occurs predominantly in the Cripple Creek/Victor area. Visitor figures were supplied by the Imperial Hotel in Cripple Creek and were obtained from the Cripple Creek Museum, which until 1979 operated with free admission and kept accurate visitor records. The records indicate that approximately 150,000 people visited this area during June, July, and August of 1979. The Imperial Hotel management estimates that another 50,000 visitors come to the area during May and September, and on weekends during the fall foliage season. Many of these people come from the Colorado Springs area and are day visitors only. Waste generation studies of recreational visitors to U.S. Forest Service lands indicate that day use picnickers generated roughly 1.1 lb. of waste per day (4). This figure can reliably be applied to tourists in this area to calculate their current annual waste volume production of 110 tons. The calculation follows:

$$\frac{200{,}000 \text{ persons/year} \times 1.1. \text{ lbs./person}}{2{,}000 \text{ lbs./ton}}$$

$$= 110 \text{ tons/year (over 120 days)}$$

In addition, some wastes are generated by visitors to the Florissant Fossil Beds National Monument. According to National Park Service officials, 66,652 people visited the Monument in 1980 and of this figure, approximately 50 percent used the picnic area located there. Using the 1.1. pound per person per day waste generation rate developed by the Forest Service, there were approximately 20 tons of waste generated at the Fossil Beds in 1980. The calculation follows:

$$\frac{33{,}326 \text{ picnickers/year} \times 1.1 \text{ pound/person/day}}{2{,}000 \text{ lbs./ton}}$$

$$= 20 \text{ tons/year}$$

Table 3 summarizes the waste volumes produced in Teller County's two private waste hauler service areas. As can be seen from the Table, approxi-

## TABLE 3

## CURRENT ANNUAL SOLID WASTE VOLUMES BY SERVICE AREA, TELLER COUNTY, COLORADO

| Woodland Trash Service Area | Persons | Time (Days) | Lbs./Day | Tons/Year |
|---|---|---|---|---|
| Permanent Population Waste Generation | | | | |
| Non-Bulky | 6,000 | 365 | 3.0 | 3,290 |
| Bulky | 6,000 | 365 | 0.3 | 330 |
| Seasonal Population Waste Generation | | | | |
| Non-Bulky | 1,500 | 120 | 3.0 | 270 |
| Bulky | 1,500 | 120 | 0.3 | 30 |
| Forest Service Visitors | - | 120 | - | 110 |
| | | | Subtotal | 4,030 |
| Teller County Disposal Service Area | | | | |
| Permanent Population Waste Generation | | | | |
| Non-Bulky | 2,021 | 365 | 3.0 | 1,110 |
| Bulky | 2,021 | 365 | 0.3 | 110 |
| Seasonal Population Waste Generation | | | | |
| Non-Bulky | 1,500 | 120 | 3.0 | 270 |
| Bulky | 1,500 | 120 | 0.3 | 30 |
| Cripple Creek/Victor Tourists | 200,000 | (total visitation over a 120-day period) | 1.1 | 110 |
| Florissant Fossil Bed Visitors | 33,326 | (total picnickers over a 365-day period) | 1.1 | 20 |
| | | | Subtotal | 1,650 |
| | | | TOTAL | 5,680 |
| | | | | ======= |

mately tons are currently being produced annually, 71 percent of which is being collected by the Woodland Trash Service. Approximately 29 percent is being collected by Teller County Disposal.

## C. Projected Waste Volumes

According to Census data, the permanent resident population of Teller County will increase by about 58 percent over the next ten years. The number of seasonal residents can be expected to rise at a similar rate according to local County sources. Tourism in the State of Colorado, according to estimates provided by the Colorado Office of Economic Planning, is likely to increase by 18 percent over the next ten years. Because Teller County is a popular point destination vacation area (as opposed to a drive-through area where tourists would "drive-through" on their way to another vacation area) and because of the increasing national trend toward these point destination areas, tourism in Teller County is likely to escalate as much as 20 percent over the next ten years.

Based on these assumptions, the projected total waste volume for Teller County during the ten-year study period beginning in 1981 is 72,800 tons (see Table 4). This figure is equal to the sum of the projected annual waste volumes for the ten-year study period based on a linear increase in waste volume of approximately 360 tons/year. A constant rise in population and tourism is assumed as well as a constant rate of waste generation over the study period for each resident population and visitor population segment. Overall, annual waste generation would increase by 56 percent (3,200 tons) by the year 1990.

## TABLE 4

## PROJECTED ANNUAL WASTE GENERATION TONNAGES FOR TELLER COUNTY, 1981-1990

| Study Year | Projected Annual Waste Tonnages* |
|---|---|
| 1981 | 5,680 |
| 1982 | 6,040 |
| 1983 | 6,390 |
| 1984 | 6,750 |
| 1985 | 7,100 |
| 1986 | 7,460 |
| 1987 | 7,810 |
| 1988 | 8,170 |
| 1989 | 8,520 |
| 1990 | 8,880 |
| TOTAL | 72,800 Tons |

---

* Based on a 58 percent straight-line increase in permanent and seasonal residents and a 20 percent straight-line increase in tourism, both over the ten-year study period.

## IV. EXISTING SOLID WASTE OPERATIONS

In order to characterize the current solid waste management system in Teller County, existing disposal sites, greenbox stations, and collection practices are described. An estimate of the costs incurred by the County in supporting the present system is included. Solid waste operations in Park County are summarized, and the potential for a cooperative effort between Park and Teller Counties is discussed.

### A. Collection and Transportation of Waste

**Private Collection.** Woodland Trash Service, owned and operated by Phil Bosma, supplies waste collection and transportation services for the northeast section of Teller County (see Figure 2 for description of service area), as well as for portions of El Paso and Douglas Counties. Approximately 60 percent of the residents and nearly 100 percent of the businesses in the area utilize the service. In operation six days per week, weekly or more frequent collection is provided. Ultimate disposal of compacted trash is at the Twenty-sixth Street Landfill near Colorado Springs. As mentioned previously, the greenbox station in Divide is serviced by Woodland Trash.

Weekly collection service of 1 and 1/2 to 2-cubic yard containers for commerical accounts ranges from $21.50 to $26.50 per month. Residents pay a fee of $10.00 per month for weekly collection of two garbage cans, or four bags, of waste.

The mobile equipment presently is use (owned by Woodland Trash Service, Inc.) is a 1980 International cab equipped with a 20-cubic yard packer, a 1971 White cab equipped witha 17-cubic yard packer (cab and chassis to be replaced in mid-summer with a 1981 International), and a spare 1974 White cab equiped with a 17-cubic yard Sanicruiser. Other equipment includes four six-cubic yard containers in use at the Divide greenbox site, 78 1 and 1/2-cubic yard containers and 234 two-cubic yard containers for commercial accounts.

Teller Disposal, Inc. is owned and operated by Norbie Larson, and services the southern and northwest portions of the County (see Figure 2). Approximately 40-50 percent of the residents and a high percentage of the businesses in the area utilize the collection service. The company is in operation seven days per week, and provides weekly collection for residences, mines, and other businesses throughout the County. Ultimate disposal of compacted trash is at the Cripple Creek disposal site.

Teller Disposal collects waste from the Florissant greenbox station, and provides collection for a single six-cubic yard greenbox at Florissant Fossil Beds National Monument (financed by the National Park Service). Both residences and businesses utilize the collection service in the Cripple Creek area, while primarily mines are serviced in the Victor area. Victor residents dispose of their waste directly at the Victor disposal site. Weekly collection of commercial accounts is performed for a monthly fee of $20.00 to $40.00, depending on waste quantities. Residences are serviced weekly for a monthly fee of $4.00. Teller Disposal also transports bulky items (such as automobile bodies) to Pueblo once per year, for metals reclamation.

Equipment currently owned and used by Teller Disposal, for collection and disposal of waste, includes: a four-wheel-drive loader with a three-cubic yard bucket, a D-8 Cat tractor, a track loader with a three-cubic yard bucket, an Austin motor grader, a 25-cubic yard capacity Packmore on a 1966 10-wheel White tractor, a 20-cubic yard capacity packer on a single axle tractor, two tractor trucks, each with a 30-cubic yard trailer, numerous flat trailers, a ten ton, six-wheel-drive crane, 14 six-cubic yard containers, and 21 two-cubic yard containers.

**Federal Collection.** The U.S. Forest Service collects waste from greenboxes in five campgrounds and one picnic area in Pike National Forest, in northern Teller County. Waste is transported by the Forest Service to disposal sites near Colorado Springs.

## B. Greenbox Transfer Stations

**Divide Greenbox Station.** The Divide greenbox station, located in Figure 1, is operated by the County. Four 6-cubic yard greenboxes, owned by Woodland Trash Service Inc., are present in a locked, fenced enclosure. The site is located on County-owned land and is open three days per week, from 10 am to 4 pm. A user fee of 50¢ per bag of waste is collected by an attendant. The County pays Woodland Trash Service Inc. $5.75 per cubic yard of uncompacted waste, for collection of trash from the greenboxes and its disposal at the Twenty-sixth Street Landfill near Colorado Springs.

**Florissant Greenbox Station.** The Florissant station (see Figure 1) is operated by Teller County and is serviced by Teller Disposal, Inc. The land is rented for a fee of $75 per month. The site is open three days weekly, with access controlled by a locked gate. Six six-cubic yard greenboxes are present in an unfenced area. A fee of 50¢ per bag of waste is charged, which is collected by an attendant. Teller Disposal, Inc. receives $4.50 per cubic yard of waste collected from the Florissant station. Ultimate disposal is at the Cripple Creek disposal site.

## C. Disposal Sites Presently in Use

**Teller County Disposal Sites.** Two disposal sites are currently in use. The Cripple Creek site (see Figure 1), located approximately one mile north of the city limits, is owned and operated by Norbie Larson of Teller Disposal, Inc. It services roughly the southern and northwest portions of the County, excluding the Victor area. The 10 acre site, part of a 120 acre parcel, has been in operation for nine years. At the current usage rate, the owner estimates that the site has more than twenty years of life remaining. A land use fee of $2,333.33 per month is currently paid to Teller Disposal by the County for use of the site and to subsidize operations at the site. The site is located in a drainage emptying into Barnard Creek, and some surface water diversion ditches are present. Burning takes place intermittently, and waste is covered on an irregular basis. White goods (appliances) and auto bodies are accepted at the site. There is no sign of the presence of industrial waste, septic sludge, or dead animals. An attendant is not present, and no fee is charged to individuals disposing of waste. The Colorado Department of Health (CDH) has recommended closure of the site as it is currently operated, due to potential surface and ground water pollution, inadequate diversion of surface water, the presence of vectors and odors, the lack of adequate cover, and uncontrolled burning. An additional discussion of continued use of the Cripple Creek site as a sanitary landfill, following substantial upgrading, may be found in Chapter VI.

The Victor site is located approximately 3/4 of a mile west of Victor (see Figure 1), and is owned by the City. The dumping area is approximately 2 and 1/4 acres in size and has extended to surrounding land owned by Jim Chapman. The facility has no operational management, and no fee is charged for disposal. The site has been in use by Victor residents since 1904. Use of the area consists of dumping waste into a steep ravine, which drains directly into a tributary of Wilson Creek. The Colorado Department of Health has recommended closure of this site, due to lack of surface water diversion facilities, lack of cover material and fencing, and frequent uncontrolled burning. Department of Health authorities report that "cover material is not readily available at the site and operations would have to be changed drastically to allow for proper maintenance". The site will not be considered as a potential sanitary landfill site in this study.

Another landfill, located 1/2 mile northwest of Woodland Park, was operated by Woodland Trash Service Inc. until 1979. The land is owned by the local government and was leased for waste disposal use. After a fire occured, the site was covered and closed. Due to the site's proximity to residences, it will not be considered as a candidate sanitary landfill site in this study.

**El Paso County Disposal Sites.** According to the El Paso County Land Use Department, four private landfills are currently in use in the Colorado Springs area (see Figure 3). All four sites have Colorado Department of Health (CDH) Certificates of Designation and are in compliance with CDH regulations.

The Twenty-sixth Street Landfill, operated by Nick Pinello of Solid Waste Management, receives the most use in El Paso County, and is the landfill utilized by Woodland Trash Service Inc. Present rates are $1.10 per cubic yard of waste disposed. It is estimated that 40 total acres are available for use. The landfill may be closed in four years, as the lease on the land is not expected to be extended.

The Pinello East Landfill, operated by Nick Pinello, is reportedly nearing capacity, although 14 acres of additional area may be available to lease.

A third site, the Templeton Gap Landfill (operated by Cole Shacklette), is a 40 acre tract which is approximately 60 percent full. Its estimated future life is five years. Another 40 acre parcel is adjacent, and an attempt will be made to have the area certified for sanitary landfill use.

Finally, the Fountain Valley Landfill, operated by Jerry Schramek, is an approximately 40 acre site, estimated to be about 20 percent full. It is not a highly used facility, and has many years of life remaining, although it would reach capacity much more quickly if the other three landfill sites were not available. Recommendations concerning the future use of El Paso County sites by Teller County are summarized in Chapter VII.

## D. Cost of the Present System

Teller County's solid waste budget for 1980 was $78,810, about 2.85 percent of the total County budget ($2,763,987). The cost included $46,545 for collection and disposal of waste from greenbox stations in Divide and Florissant, paid to Woodland Trash Service Inc. and Teller Disposal, Inc., respectively. Salaries for greenbox station attendants at the two sites amounted to $7,269. A fee of $2,083 per month (or $24,996 for the year) was paid to Norbie Larson of Teller Disposal in 1980, for use of his land in Cripple Creek for waste disposal purposes and for operation of the landfill.

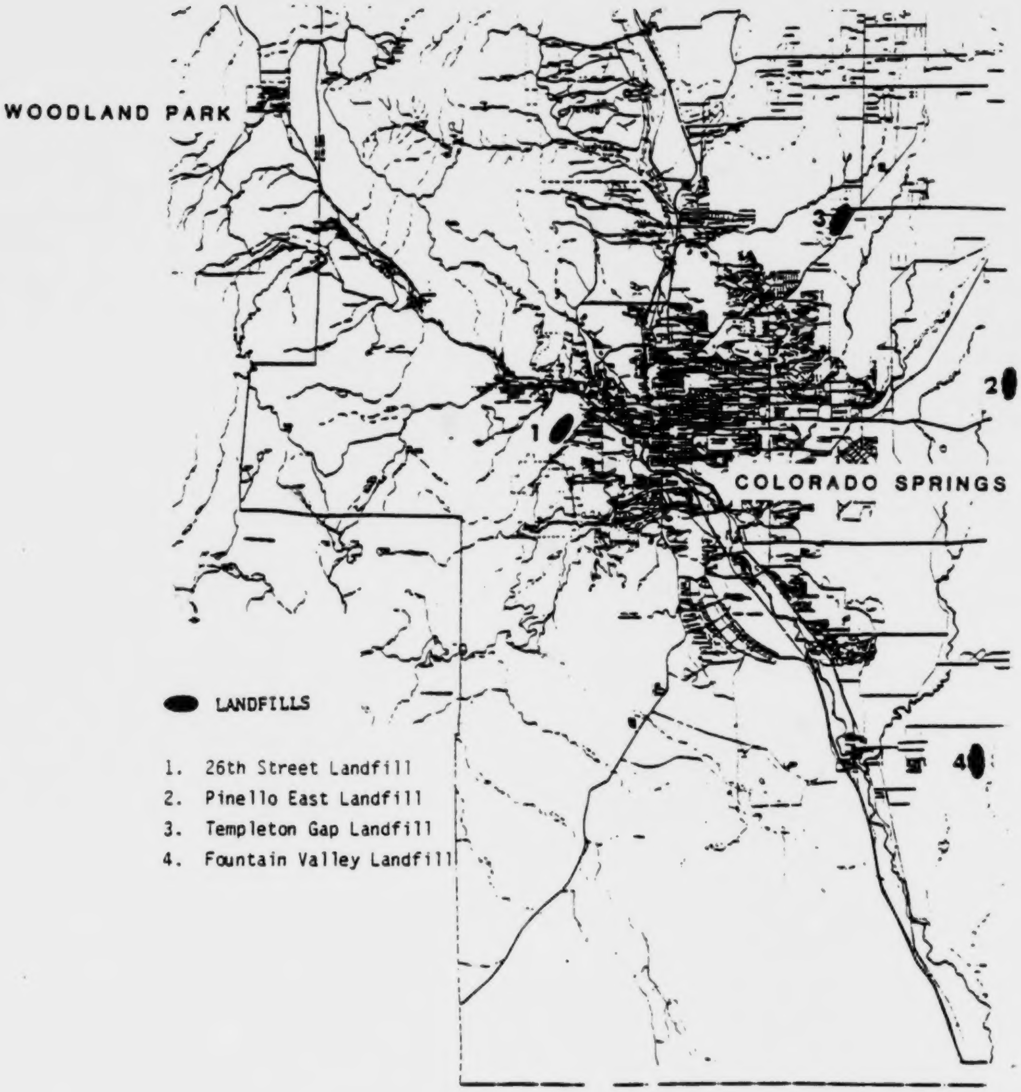
A total of $11,167 was generated through greenbox user fees (25¢ per bag of waste) in 1980. It should be noted that rates for use of the greenbox stations have recently increased to 50¢ per bag. For 1981, $88,590 has been apportioned for the solid waste budget, out of a total County budget of $3,189,088.

## E. Solid Waste Operations in Park County

The potential for joint operation of a solid waste facility with Park County is an alternative to be addressed in this study. Currently, the Park

## FIGURE 3

## EL PASO COUNTY DISPOSAL SITES


WOODLAND PARK
COLORADO SPRINGS
1
2
3
4
● LANDFILLS
1. 26th Street Landfill
2. Pinello East Landfill
3. Templeton Gap Landfill
4. Fountain Valley Landfill

Reproduced from best available copy.

SOURCE: PIKES PEAK AREA COUNCIL OF GOVERNMENTS (5).

County collection system includes two 25-cubic yard packers, 10 eight-cubic yard greenboxes (located throughout the County), and two greenbox stations (at Lake George and Bailey) consisting of a total of 18 eight-cubic yard greenboxes. Disposal takes place at Fairplay, where 15 acres of BLM land are being utilized for a trench-type landfill. County sources estimate the life of the present landfill at five years. An additional 15 acres of land has been deeded to the County for landfill use, and its estimated life is also five years.

No previous communication has occured between Park and Teller Counties, regarding a joint effort in solid waste planning according to the Park County commissioner contacted during this study. Park County Commissioners are willing to discuss the possibility of a future joint effort, if a cost savings would be realized. Generally, solid waste disposal becomes more cost effective when a larger number of users are involved, due to economies of scale. Because the life expectancy of the Park County landfill appears to be about ten years, it does not seem probable that Park County would assist in supporting a joint effort at this time. However, beyond that period a joint effort might be the most reasonable alternative for cost savings. It is recommended that the Counties initiate a discussion of alternatives (e.g., joint financing of a centralized landfill site) at this time to anticipate a potential cooperative venture in the future.

## F. Applicable Laws and Regulations

The Resource Conservation and Recovery Act of 1976 requires individual states to formulate a solid waste management plan. Current federal regulations are not, however, mandatory at the county level. Currently, in Colorado, all solid waste disposal sites and facilities are regulated by the Colorado Department of Health under directives adopted in 1972.

The current State of Colorado solid waste disposal sites and facilities regulations are included in Appendix A and guidelines used by the Colorado Department of Health to review solid waste disposal sites and facilities are listed in Appendix B. The Colorado Department of Health reviews sites and facilities in order to recommend approval or disapproval of an application for a Certificate of Designation which is needed before an applicant can dispose of any solid waste. The CDH makes its recommendations to the County Commissioners who then issue the Certificate of Designation to the facility.

## V. SANITARY LANDFILL SITE SELECTION PROCESS

### A. Initial Selection Criteria

The sanitary landfill site selection process in Teller County was based on a systematic, integrated study and evaluation of relevant physical conditions, as well as economic and social/political constraints. The technique employed in site selection is outlined below. By definition, sanitary landfilling is an engineered method of disposing of solid waste on land by spreading the waste in thin layers, compacting it to the smallest practical volume, and covering the waste (ideally, each working day) in a manner which protects the environment (6). No burning of solid waste occurs at a well-operated sanitary landfill.

Teller County participated in the landfill site selection process in the past, and numerous potential sites were identified and rejected due to various environmental and political problems. Records of previous work were generally unavailable, although certain areas were identified with the aid of County officials. Three sites, of the 35 total sites considered in this study, had been identified previously. None of the five final candidate sites have been evaluated in the past.

The general selection process involved the initial elimination of unsuitable areas of the County, resulting in 35 possible sites. After extensive field investigation, the five most suitable sites were selected. These sites were then rated according to a quantitave review process. The steps involved in each phase of the selection process are detailed below.

When initially choosing potentially suitable areas in the County, the primary constraint was conflicting land use. Teller County's Master Plan maps were used to delineate all areas zoned as agricultural. This zone was considered exclusively for landfill locations, on the recommendation of the County Planner, thus eliminating significant areas of the County. Land committed to present and planned State parks and wildlife areas, and national monuments, was excluded. In addition, land managed by the U.S. Forest Service was exempted from consideration, after communication with District Forest Service authorities indicated that the land would be unavailable for landfill use, due to the high percentage of private land in the County. Land administered by the Bureau of Land Management and the State of Colorado was actively considered.

Other criteria used in the initial phase of selection were environmental and economic constraints. Topographic maps (7 and 1/2 minute) were used to choose areas with a slope less than 15 percent, as steep slopes are subject to accelerated soil erosion, increased surface water runoff problems, and cause difficulty in the operation of equipment. Floodplain maps, obtained from the Federal Emergency Management Agency (7), were used to delineate areas located in the 100-year floodplain. Direct proximity to underground pipelines or utility power easements, was determined from topographic maps. No sites were located in the 100-year floodplain, or adjacent to pipelines or easements. Areas located less than 1/2 mile from an existing improved road were considered most preferable because of ease of access. Sites which would affect critical wildlife habitat, endangered species, geothermal resources or archeological artifacts were not considered. When this process was completed, a total of 35 sites had been chosen.

Following a detailed field investigation of the sites and utilizing soils information supplied by the Soil Conservation Service (SCS), the number of potentially suitable sites was reduced to five. Although no published soil survey was available for the study area, SCS authorities assisted in a site by site review of soil types. Areas with deep soil with a suitable texture were determined to be appropriate for landfilling. Sites were removed from consideration after field investigation revealed the presence of one or more of the following constraining factors: the immediate proximity of the site to residences, inadequate screening potential (from wind and visibility), lack of sufficient soil depth, and severe topographical limitations not detectable from the topographic maps. Appendix C contains a series of maps illustrating where the 35 sites are located and a brief summary of why most of the sites were eliminated from further consideration.

## B. Site Descriptions

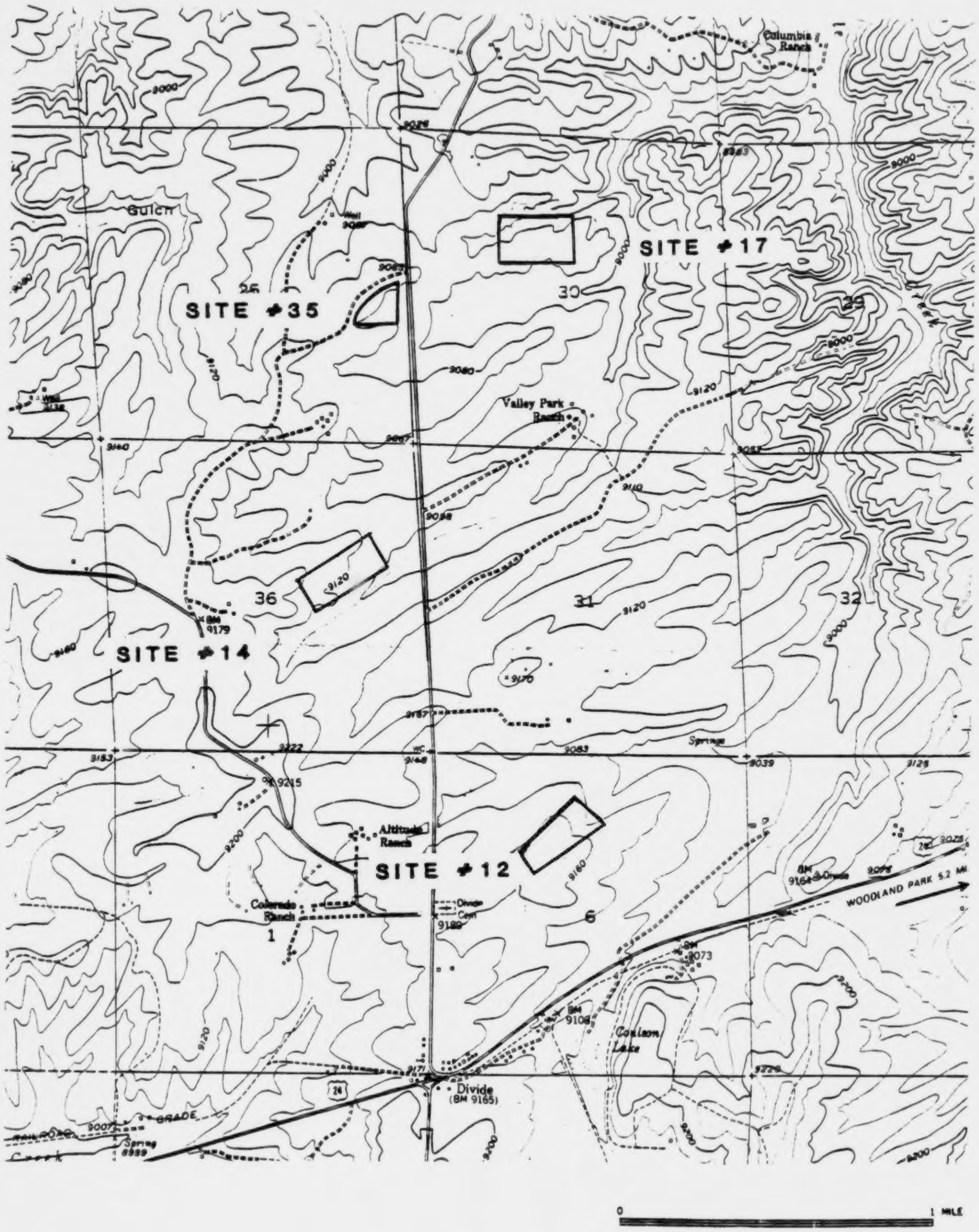
The following section describes four of the sites according to location, haul distance, access, size, surface and groundwater impacts, topography, soil depth, screening (for wind and visibility) and vegetation. The fifth site (the present Cripple Creek disposal site), has been described in Chapter III.

**Site #12.** Owned by Gordon Mahoney, this site is located approximately 3/4 miles northeast of Divide (see Figure 4), with access from Highway 24 and North Road. At least 40 acres in size, the site lies at the head of an intermittent stream drainage which empties into Rule Creek approximately one mile downstream. Diversion ditches would be necessary to divert upslope runoff. Slope averages about 10 percent, and the site is partially screened by trees. Several springs are located about 1/2 mile down the drainage, but the site is 80-120 feet higher in elevation than the springs. Stream cuts indicate a soil depth of at least six feet. The site is situated on open grassland, and is very exposed to wind, particularly from the southwest. Due to the wind problems and visibility from houses to the north, screening and berms will be needed. Vegetation at the site is primarily open grassland.

**Site #35.** Located about 2 and 1/2 miles north of Divide, the site is easily accessible from both North and Ridge Roads. It is owned by Lewis and

# FIGURE 4

# TELLER COUNTY POTENTIAL LANDFILL SITES



SITE #35
SITE #17
SITE #14
SITE #12
Gulch
Columbia Ranch
Valley Park Ranch
Altitude Ranch
Colorado Ranch
Divide
(BM 9165)
Coulson Lake
WOODLAND PARK 5.2 MI
GRADE
Creek
Spring
25
30
29
36
31
32
1
6
9000
9026
9063
9080
9120
9160
9170
9179
9215
9200
9110
9073
9106
9189
0
1 MILE

Leila Larson, and the availabile area is 15-20 acres, with approximately 10 acres usable for landfill operation. This site is partially screened by trees to the east and south, and is fenced on three sides. Two ephemeral drainages are present, and the average slope is 10-15 percent. Diversion ditches would be necessary. A well is located 1/4 mile to the northwest, but no data concerning it is available from the State Engineer's well records.

Soil Conservation Service (SCS) information indicates a soil depth of about five feet, but no road or stream cuts were present to verify this information. Vegetation at the site is open grassland and mixed conifer and aspen forest.

**Site #17.** This potential site, owned by Lewis and Leila Larson, is about 2 and 3/4 miles north of Divide, and 1/4-1/2 east of North Road. A gravel access road to the site already exists. About 40 acres in size, the site drains into an intermittent stream 1/4 mile to the east, which empties into Rule Creek. Diversion ditches would have to be constructed to mitigate possible surface water contamination problems. Well screened from North Road, this site requires less wind fencing than the other potential sites. Slope averages 8-10 percent, and soils are five feet in depth, according to the SCS soil description. The site is situated partially on open grassland and partially on mixed conifer and aspen forest.

**Site #14.** Owned by Geraldine Shoemaker, this site is 1 and 1/4 miles north of Divide on North Road, and about 1/2 mile east, located along an intermittent stream drainage. Surface water diversion ditches would be necessary. Approximately 40-60 acres appear to be usable for landfilling. Slope is about 10 percent, and the soil is at least six feet deep, as verified by intermittent drainage cuts. Located on open grassland, the site is susceptible to blowing litter problems, and more screening and wind fencing would be required than for any of the other sites.

## C. Quantitative Review Methodology

In evaluating the five sites, a quantitative scoring system was utilized, as recommended by the American Society of Civil Engineers (8). An advantage of this method is its organized approach to the quantification of engineering and environmental judgements, and to economic, social, and political considerations. The results of this methodology can be used in conjunction with the specific capital and operating cost estimates of each alternative (developed in Chapter VI) and the availability of the land in order to select the most readily useable cost-effective site. The scoring system ranks sites by assigning scores to relevant factors. For example, consider surface water impacts as a factor. If a site is located less than 1 and 1/2 miles (along drainage) from the perennial stream into which it drains, that site would receive a score of 1 (on a scale of 1 to 2), while a site located more than 1 and 1/2 miles from the stream would receive a more favorable score of 2. A total of four sites (see Figure 4), and the present Cripple Creek disposal site, have been evaluated using this system. The siting factors and quantitative review system are discussed in the following sections.

**Siting Factors.** In this study, the factors considered relevant were soil depth and type, slope, area (size of site), impact on groundwater, impact on surface water, haul distance, road access, necessity of screening (due to wind or visibility), and adjacent land use. These factors, and the rationale for their selection, are discussed below.

### Soil Depth and Type

Soil depth is an important consideraton in selecting appropriate landfilling techniques and determining whether an adequate amount of cover material (particularly daily cover) exists for the operation. Soil type is also a factor, although a wide range of soil types is usuable for daily cover. Cover material can be transported to the site if inadequate cover material is present, but this alternative is more costly. In this discussion, the term soil refers not only to the actual surficial soil horizons, but to any unconsolidated rippable weathered rock or bedrock material.

A detailed soil survey has not been published for Teller County but district Soil Conservation Service personnel provided assistance in determining soil types for sites which have been mapped, and used interpolation to predict the most likely soil compositions for areas not yet mapped. The soil type at the Cripple Creek site is the Fourmile Series, according to the SCS. The series consists of deep, well to excessively drained soils formed from material weathered from granite. Typically the surface layer is gravelly to very gravelly coarse sandy loam. The subsoil is very gravelly coarse sandy loam, overlying very gravelly coarse sand or loamy sand, extending to a depth of five feet or more. The land use section of the soil description provided by the SCS suggests that seepage may be a problem in using the soil for landfill purposes.

The predominant soil type present at the other four sites is Brinkert Loam, a deep, well-drained soil formed in alluvial fan material derived from granite. It is typically 5 feet or more in thickness. The surface layer is typically loam. The subsoil is a heavy clay loam or clay, and the substratum is clay loam or sandy clay loam. In some places, shale occurs within 25 inches of the soil surface. The soil types present at the five candidate sites appear to be suitable for landfilling. Therefore, sites will be scored on soil depth only. Three feet of soil will be needed for all the landfill site operations; one foot for intermediate soil cover (for operational vector, fire, litter, and moisture control), and two feet for final cover. Final cover serves basically the same functions as intermediate cover, but it must also support vegetative growth. A more favorable score will be assigned to sites with a soil depth of at least three feet. Before a specific site is selected, a site specific soil survey, including soil borings, will be necessary. The regional SCS office will perform the survey if requested. According to the district SCS, it will take about six months to have the survey done.

### Slope

Slope serves as an important factor in determining the method of landfilling, selection of equipment, design of drainage controls, etc. A more favorable score is assigned to the flatter slopes, which, in this study, were chosen to be less than 8 percent. Slopes greater than 8 percent can require substantial grading to mitigate erosion and surface water runoff problems, and can present equipment operational difficulties.

### Area

Sites which are larger than 20 acres in size will receive a higher score than smaller sites. Current County waste production will require approximately one acre per year for a trench landfill and three-quarters of an acre for an area landfill (see Appendix F for the calculation). Theoretically only 9 (area landfill) to 12 (trench landfill) acres would be necessary to accommodate waste for the scope of the ten year study period, using projected waste yardages. However, larger sites lend more flexibility to landfill operation by including room for a buffer zone and future expansion. A larger size also increases the potential for on-site cover procurement and allows for a more shallow fill depth, if a thin soil makes shallow fill depth necessary.

### Ground Water Impact

To assess the risk of ground water contamination by landfill-produced leachate, the location of the zone of saturation must be determined, as well as the direction and rate of flow of the ground water. Because of the relative importance of this parameter, it is included as a siting factor even though site specific ground water data does not exist for the five sites. It should be emphasized that a detailed engineering analysis (including the drilling of test wells) must be performed at the chosen potential site, before the site can be determined to be suitable for landfilling. When such information does become available, following a detailed engineering analysis, it can be assimilated into the scoring system matrix. As a rule of thumb, a sanitary landfill should be located at least five feet above the seasonal high water table. Therefore, if a fifteen-foot trench is excavated, the high water table will have to be at least five feet below the bottom of this trench. A landfill less than five feet above the seasonal high water table is unacceptable in practice unless costly modifications, such as liners, are constructed. In this study a fifteen-foot separation has been designated as the ranking criterium. Sites having more than fifteen feet of separation will receive a higher ranking. If fifteen-foot trenches are used, groundwater test borings (which will also indicate the direction of ground water flow) will need to be drilled to a depth of thirty feet. This fifteen-foot depth guideline will be useful in scoring a site when site specific data is available.

Very limited relevant ground water information is available for wells that are in proximity to the landfill sites. What information is available is listed in Table 5. The wells listed are located within a half mile radius of each site. The data supplied in Table 5 is not intended to represent the exact ground water conditions at each of the sites and was not applied to the evaluation of ground water at the sites. Data is available for three of the sites and indicates that the risk of ground water contamination at those sites is low.

### Surface Water Impact

Leachate production might also result in the pollution of surface water bodies, and landfills should not be located in direct contact with the surface water system. Although all five sites are located in ephemeral or intermittent drainages, the potential surface water impact will be rated according to distance to the perennial drainage into which runoff from the sites would flow (Rule Creek or Barnard Creek). Sites which are more than 1 and 1/2 miles from these creeks (along drainage) receive a more favorable score. Sites close to perennial drainages will require more costly surface drainage diversion structures to mitigate possible surface water pollution problems.

### Haul Distance

The distance of the landfill site from the Woodland Park area, the principal area of waste generation in the County, represents the haul distance. Given the increased cost of a longer haul, a more favorable score is assigned to a site that is within 9 miles of Woodland Park. The Cripple Creek site was assigned a favorable score due to its proximity to Cripple Creek and Victor, major waste generation centers in southern Teller County. The Cripple Creek site will not be considered for use as a County-wide landfill, due to the long haul distance from northern Teller County.

### Access

Each site is ranked for access because of the great expense involved with road construcion. Currently, it costs approximately $120,000 per mile to construct an unpaved road, and up to $200,000 per mile to build a paved road (9). In the initial phase of site selection, all sites located more than 1/2

## TABLE 5
## AVAILABLE GROUND WATER INFORMATION, TELLER COUNTY STUDY AREA*

| Well Location+ | Closest Potential Landfill Site | Owner<br>Year Completed | Well Depth (ft.) | Depth to Water (ft.) | Proximity to Site |
|---|---|---|---|---|---|
| T. 13 S., R. 70 W., Sec. 36, NESW | 14 | William Bolinger<br>1972 | 145 | 103 | adj. 1/4 1/4 sec |
| T. 13 S., R. 70 W., Sec. 36, SESW | 14 | Robert Christian<br>1972 | 145 | 97 | adj. 1/4 1/4 sec |
| T. 13. S., R. 70 W., Sec. 36, SENW | 14 | Wolfgang Heinze<br>1972 | 200 | 110 | adj. 1/4 1/4 sec |
| T. 13. S., R. 69 W., Sec. 30, SWSW | 14 | Jack Previtt<br>1974 | 65 | 65 | adj. 1/4 1/4 sec |
| T. 12 S., R. 69 W., Sec. 30, NWNW | 17 | Bill Hayer<br>1962 | 86 | 78 | adj. 1/4 1/4 sec |
| T. 12 S., R. 69 W., Sec. 30, NWNW | 17 | Jimmie Hileman<br>1969 | 250 | 89 | same 1/4 1/4 sec |
| T 12 S., R. 69 W., Sec. 30 SWSW | 35 | D.A. Roberts<br>1979 | 95 | 27 | adj. 1/4 1/4 sec |
| No Wells | 12 | -- | -- | -- | -- |
| No Wells | Cripple Creek | -- | -- | -- | -- |

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* Source: Colorado Department of Natural Resources, Office of the State Engineer (10).

+ Well locations are listed by township (T), range (R), section (1-36), and quarter-quarter section. A listing such as Section 1, SE 1/4, NE 1/4 indicates a 40 acre parcel located in the southeast 1/4 of the northeast 1/4 section of section 1. Most well are located in quarter-quarter sections adjacent to potential landfill sites.

mile from an improved all-weather road were eliminated. Sites located on an improved all-weather road or with close access (1/4 mile or less) to one via existing roads are scored higher than sites with no access or more distant (greater than 1/4 mile) existing access to an improved road surface.

### Screening

Sites which require screening or fencing to mitigate visibility problems or control blowing litter have been assigned less favorable scores. Fencing, earthen berms, trees, or hedges may be needed to screen the landfill operation. Peripheral fences may be used to control or limit access, and movable litter fences are used to control blowing paper in the immediate vicinity of the working face of the landfill.

### Adjacent Land Use

Although the five candidate sites are not located on lands which are unacceptable for landfill use, conflicting adjacent land use may present barriers to acceptability. Proximity to municipal areas or residential development may be objectionable due to noise, odors, dust and vector problems occassionally associated with sanitary landfills. In a rapidly developing County such as Teller, the most difficult part of siting a landfill is finding suitable land which is not adjacent to a conflicting use. The high growth rate of subdivisions and private home building dictate that landfill development take into consideration present and planned development. Sites which are more than 1/4 mile from a residential zone or city limits will receive a more favorable score.

**Quantitative Review System.** Each of the above factors has been divided into two categores and assigned scores of either 1 or 2, with a score of 2 indicating a more favorable condition. Table 6 lists the siting factor, the two relevant categories, and the scores assigned to each category. Because at the present time there is no accurate ground water data for the sites in question, this siting factor was not included in the scoring analysis.

Table 7 summarizes the site-specific data with respect to the eight remaining siting factors described above for each of the five potential landfill sites. For each site in Table 7, the score assigned for each siting factor is also listed.

The site selection system used for Teller County in this study represents the case in which all eight siting factors are perceived as being equally important and receive equal weights. However, it is possible to use different assumptions regarding the importance (weight) given to each of the eight siting factors.

## TABLE 6

## LANDFILL SITING FACTORS AND RATINGS ASSIGNED TO FACTOR CATEGORIES

| Siting Factor | Factor Scaling Categories* | Ratings |
|---|---|---|
| 1. Soil Depth | > 3 feet depth | 2 |
| | < 3 feet depth | 1 |
| 2. Slope | < 8 percent | 2 |
| | > 8 percent | 1 |
| 3. Area | > 20 acres | 2 |
| | < 20 acres | 1 |
| 4. Ground Water Impact | GW depth > 15 feet below landfill | 2 |
| | GW depth < 15 feet below landfill | 1 |
| 5. Surface Water Impact | > 1 1/2 miles from perennial stream | 2 |
| | < 1 1/2 miles from perennial stream | 1 |
| 6. Haul Distance | 0 - 9 miles | 2 |
| | > 9 miles | 1 |
| 7. Access | < 1/5 mile to existing all-weather road | 2 |
| | > 1/5 mile to existing all-weather road | 1 |
| 8. Adjacent Land Use | > 1/4 mile from conflicting land use | 2 |
| | < 1/4 mile from conflicting land use | 1 |
| 9. Screening | Screening not required | 2 |
| | Screening required | 1 |

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* > - greater than
< - less than

# TABLE 7
## RATING SYSTEM:
## POTENTIAL SANITARY LANDFILL SITES

| Site Number Ownership Location | Soil Depth (Feet) | Area (Acres) | Slope (Percent) | Access (Miles from existing improved road) | Haul Distance (Miles from Woodland Park) | Surf. Water Impacts (Miles from peren. steam) | Screening | Adjacent Land Use | Total Score |
|---|---|---|---|---|---|---|---|---|---|
| #12<br>Gordon Mahoney<br>T. 13 S., R. 69 W.,<br>Sec. 6, NENW & SENW | 6* | 40 | 5-10 | .6 | 8 1/2 | 1 1/4 | Necessary | 1/4 mile from Divide City Limits | |
| SCORE | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 11 |
| #35<br>Lewis & Leila Larson<br>T. 12 S., R. 70 W.,<br>Sec. 25, NESE | 5† | 15 | 10-15 | .06 | 9 1/2 | 1 3/4 | Not Necessary | No Apparent Conflict | |
| SCORE | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 13 |
| #17<br>Lewis & Leila Larson<br>T. 12 S., R. 69 W.,<br>Sec. 30, SENW | 5† | 40 | 8-10 | .2 | 10 | 1 1/4 | Not Necessary | 1/4 - 1/2 mile from Residential Zone | |
| SCORE | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 12 |

## TABLE 7
## RATING SYSTEM:
## POTENTIAL SANITARY LANDFILL SITES (Continued)

| Site Number Ownership Location | Soil Depth (Feet) | Area (Acres) | Slope (Percent) | Access (Miles from existing improved road) | Haul Distance (Miles from Woodland Park) | Surf. Water Impacts (Miles from peren. steam) | Screening | Adjacent Land Use | Total Score |
|---|---|---|---|---|---|---|---|---|---|
| #14<br>Geraldine Shoemaker<br>T. 12 S., R. 70 W., Sec. 36, SWNE, SENE, NWSE, NESE | 6* | 40 | 10 | .2 | 8 3/4 | 2 3/4 | Necessary | 1/4 - 1/2 mile from Residential Zone | |
| SCORE | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 13 |
| Cripple Creek Site<br>Norbie Larson<br>T. 15 S., R. 70 W., Sec. 12, SWNW | 6* | 10-20 | 15 | Located on an existing unimproved road | 1** | 3/4 | Not Necessary | 1/2 mile from residential zone | |
| SCORE | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 13 |

* Field Observation

† Soil Description

** Miles from Cripple Creek

For example, a greater significance could be assigned to the economic factors, e.g., area (i.e., site life), haul distance, and access, if they are perceived to be the most important. The sites would then receive different scores. Regardless of the weighting used, with proper site modifications any of the five sites could be operated in a manner that would not prove detrimental to public safety or the environment. The scoring system used results in a possible range of scores from 8 to 16. All five sites evaluated range from 11 to 13, indicating their similarity. In comparison, the Victor disposal site would receive a score of 9 in this system (with 8 being the lowest possible score), due to its excessive slope, lack of soils, and proximity to surface water. Because of these problems, the continued operation of the Victor disposal site cannot be recommended. In conclusion, the site selection process provides the County with five good quality potential sites from which to choose, based on availability and other factors.

# VI. EVALUATION OF SANITARY LANDFILL ALTERNATIVES

## A. Potential Landfill Sites: Costs and Operational Plans

The best designed disposal facility will be of little value unless it is constructed and operated as prescribed. This is especially true of a sanitary landfill because it is under construction up to the day the last pound of solid waste is disposed of.

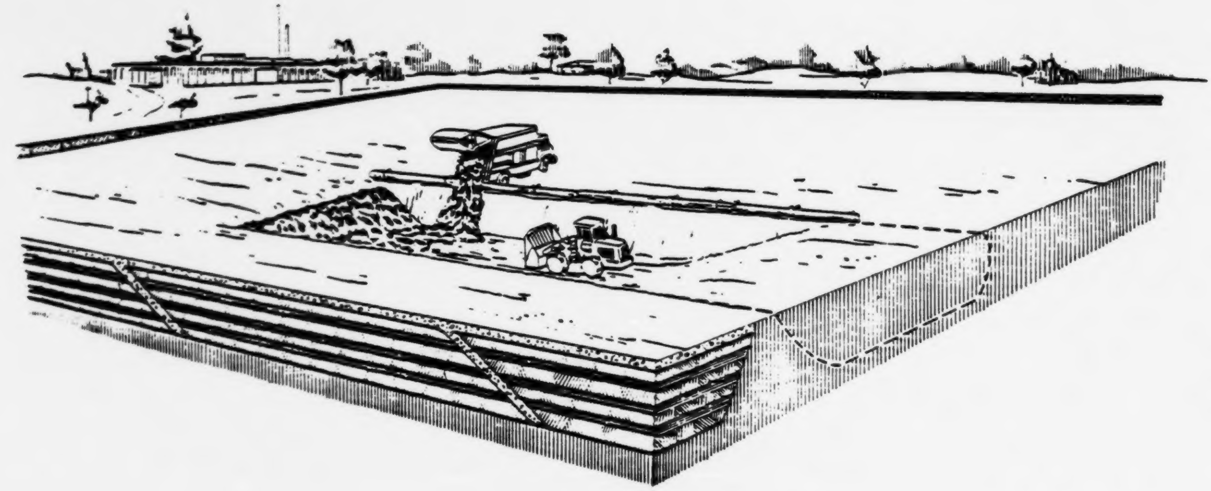
The two basic landfilling methods are the trench method and the area fill method; other approaches are essentially modifications to these two methods (see Figure 5). Basically, the trench method is used in areas where the seasonal high water table is relatively low and the soil is more than six feet deep. It is best employed on flat or gently rolling land. The area method can be followed on most topographies and is often used if large quantities of solid waste must be disposed of or if the size of the site is a constraining factor. Of the five most suitable potential landfill sites in Teller County, two require the area method (site 35 and the Cripple Creek site), another requires the trench method (site 14), and at the two remaining sites a combination of the two methods can be used (sites 12 and 17). A combination of the two methods will effectively double the useable life of the landfill site.

The operational plan and the cost for a trench landfill will be the same for each site no matter which of the potential sites is chosen. The same is true for an area landfill at each site. As mentioned previously, soil borings and test wells will be necessary before a final site is chosen. The four sites are quite similar physically and will receive the same volume of wastes and, because of this, they will have comparable costs and operational plans. Barring any unusual circumstances, the amount of waste received is the major factor governing the design and cost of a landfill.

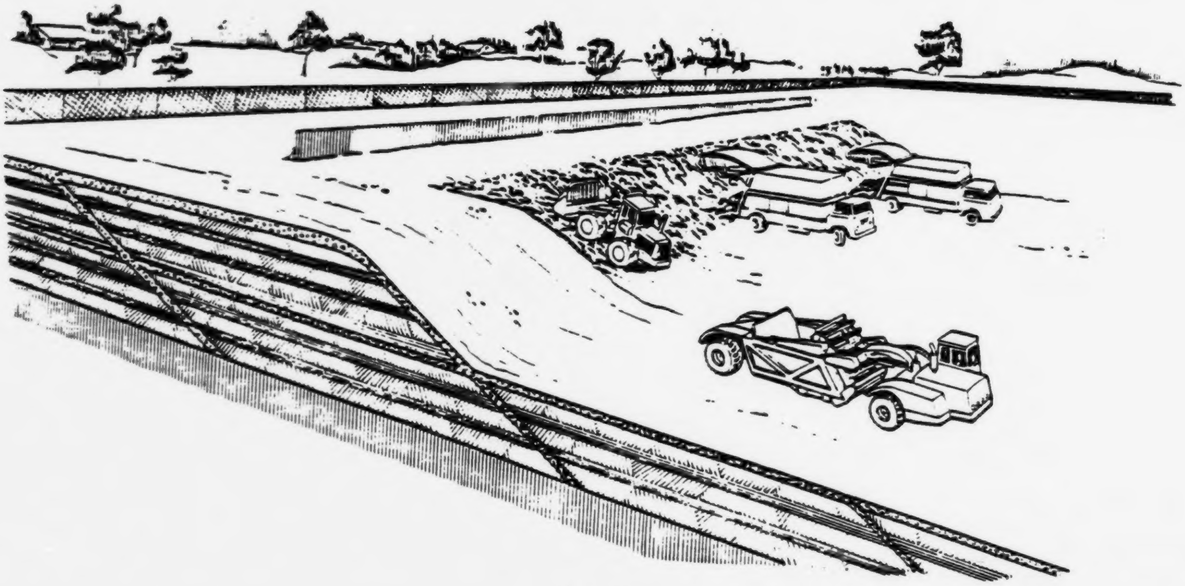
With either landfilling method, it was assumed that the site will be open to the public 6 days a week with a fulltime operator on duty. The landfill should remain open for this amount of time in order to provide a disposal facility that is compatible with the County's private waste haulers who currently collect waste 6 days a week. The site could remain open 4 hours in the afternoon on Mondays and Wednesdays and 7 hours on Tuesdays, Thursdays, Fridays, and Saturdays. An extra hour will be needed each day (after the landfill is closed to the public) to compact and cover the trash, and to provide general site maintenance. The operator should be well versed in all aspects of landfill safety; safety aspects are reviewed in Appendix D.

# FIGURE 5

## TRENCH AND AREA METHODS OF SANITARY LANDFILLING



Trench Method



Area Method

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SOURCE: BRUNNER AND KELLER (6).

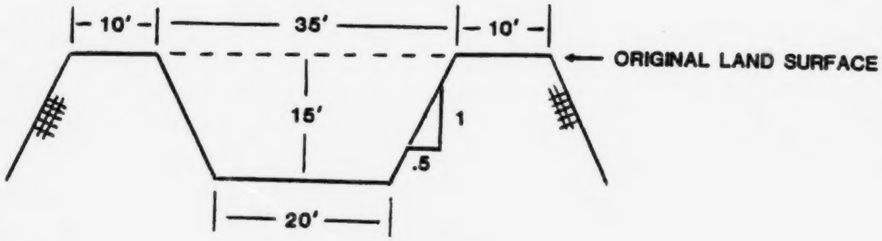
Seasonal changes in the amount of waste received (there will be less in the winter) should not affect these hours of operation. Although less time will be needed to supervise public waste disposal at the site during the winter, more time will be required to attend to the increased operating requirements brought on by inclement winter weather. During the winter, additional time will be needed for snow removal and the working of frozen cover material. During the spring thaw, wet and slushy roads will required increased maintenance.

The operation of the site could be contracted out to a private concern who would then supply the needed landfill equipment. A Caterpillar D-7 crawler-dozer (with landfill blades and a ripper) or a Caterpillar 955 crawler-loader or equivalent will be needed for both the area and the trench landfill methodologies. If operating costs are incurred by a private operator, the costs in Tables 8 and 9 would not be direct costs for the County.

**Trench Method.** Using the current annual County waste production figure of 5,680 tons/year (11,360 yd.$^3$) and a cover to solid waste ratio of 1:4 by volume, approximately 930 feet of trench will be required each year for the entire County (see Appendix F for landfill calculations). Figure 6 shows the cross-sectional dimensions of this trench which would contain 15.3 cubic yards of compacted waste for each linear foot of trench.

FIGURE 6

CROSS-SECTION OF LANDFILL TRENCH, TELLER COUNTY



These trenches would be 20 feet wide across the bottom and approximately 15 feet deep, with sidewall slopes at a 60 degree angle (depending on stability considerations). Because of the trench configuration, a minimum amount of cover material would be required each year (about 20 percent of the excavated spoil would be needed), resulting in the production of a large amount of excess fill each year. Using the current waste production figures, there will be approximately 11,400 yd.$^3$ of excess cover produced annually. This material could be stockpiled on-site, used to improve the access road or to build berms, or sold as fill for local construction projects. In order to minimize wind-produced impacts (including drifting snow), trenches should be oriented perpendicular to the prevailing wind direction at the site. Also, stockpiled cover material should be located downwind from and parallel to the trenches to further lessen the problems associated with windblown snow.

Assuming in time a series of trenches spaced ten feet apart, roughly 0.96 acres will be required for landfilling purposes each year for the entire County (see Appendix F for calculation). Because waste generation is increasing each year, however, by 1990 approximately 1,450 linear feet of trench and 1.5 acres of land will be required annually for landfilling purposes.

Table 8 presents a summary of the annual operating costs for a trench landfill in Teller County. The costs here represent total costs for a landfill serving the entire County. The capital costs for both trench and area fill methodologies vary at each site and will be listed in the specific cost summary tables for the four landfill sites. It has been assumed that equipment will be provided by a private operator. The equipment purchase price depreciation, or what it would cost to capitalize the purchase of the necessary landfill equipment, is figured into the hourly operating costs in Table 8. Profit is not included in this table.

**Area Method.** The area fill method of landfilling, where waste is applied directly onto the land surface, either with or without cover pre-stripping, is a somewhat more difficult methodology to operate efficiently. Larger volumes of trash and daily cover are usually associated with an area landfill. In an area fill, uncovered and exposed trash is more susceptible to being scattered by the wind which might present a relatively serious problem in a county as windy and exposed as Teller County. Waste sitting on top of the ground is also certainly more visible than waste deposited in a trench. Because of these reasons, the area method, although less expensive than the trench method, will not be recommended unless the small size of a site precludes the use of trenches (as at site 35). In time, as the operation becomes more efficient and as waste volume increases making daily cover more feasible, the area fill method can be used at a site previously using trenches in order to extend the life of the site. Wastes could be spread out directly on top of the previously filled trenches. Cover material stockpiled during the trenching operation could be utilized for intermediate and final cover for the area fill. Berms, constructed from the excess cover material produced during the trenching phase, used with permanent and moveable litter fences would mitigate the blowing litter problems inherent in the area fill method.

## TABLE 8

## TRENCH LANDFILL ANNUAL OPERATING COSTS, TELLER COUNTY *

| Item | Unit Cost | Units | Total Cost |
|---|---|---|---|
| Trenching | \$1.00/yd.$^3$ | 14,200 yd.$^3$ | \$14,200 |
| Spreading and Compacting (equipment) | \$60/hr. | 312 hr. | 18,700 |
| Covering | \$1.00/yd.$^3$ | 2,800 yd.$^3$ | 2,800 |
| Maintenance, Roads and Ditches (equipment) | \$60/hr. | 52 hr. | 3,100 |
| Labor, Operator | \$5.20 hr. | 2,080 hr. | 10,800 |
| Revegetation | \$1,100/acre | .96 acres | 1,100 |
| Utilities (electricity) | Lump Sum | | 500 |
| | | TOTAL | \$51,200 |

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* Sources: Caterpillar (11), Engelsman (12), McMahon (9), and Rental Rate Blue Book (13).

If the equipment is available, it is recommended that cover material be stripped from the area to be landfilled and stockpiled. Approximately 2,800 yd.$^3$ of cover will be required annually (at current waste generation rates). Labor and equipment type requirements would be the same as with the trench operation.

Table 9 presents, without including profit, a summary of the annual operating costs for an area type landfill for Teller County. This table summarizes costs for a landfill serving the entire County. The capital costs for this landfill will be listed in the specific cost summary tables for the four landfill sites.

Again, using the current annual County waste production figure of 5,680 tons/year and a cover to solid waste ratio of 1:4 by volume, approximately .73 acres of land will be needed for area landfilling in the County each year (see Appendix F for calculation). This acreage figure assumes a 12-foot cell depth. The projected 1990 waste production volume will require 1.2 acres at a 12-foot cell depth.

**Potential Landfill Site Capital Costs.** Tables 10 through 13 present the capital and annual operation costs necessary for landfill operations at each of the four selected sites. Again, sites 12 and 17 can be operated as either trench or area landfills, site 14 as a trench landfill only, and site 35 only as an area landfill. The cost tables for sites 12 and 17 contain both trench and area costs. Wind and visibility problems at site 14 preempt consideration of an area fill there. Site 35 can only be considered for an area landfill because of its small size. If either site 12 or site 17 is chosen, it is recommended that trenching be carried out until the suitable land area is used up at which time the area method could be employed.

Wind or litter fencing is recommended for three of the sites in order to mitigate problems with windblown debris. The three sites using the area fill landfill method (sites 12, 17, and 35) will require litter fencing. As a general rule, trench operations require less litter fencing because the solid waste tends to be confined within the walls of the trench. Since the location of the working face shifts frequently, litter fences should be movable. Fences such as this should be situated downwind from the working face in order to catch any blowing litter. A 10-foot high fence is advisable and costs approximately $1 for each foot of height (at a one foot fence length). The operator must clean the fence of blown litter periodically.

A shelter should be provided for the operator and for the landfill equipment. The cost cited in the tables provides for a concrete block structure with a wood truss roof and continuous shallow footing.

## TABLE 9

## AREA LANDFILL ANNUAL OPERATING COSTS, TELLER COUNTY *

| Item | Unit Cost | Units | Total Cost |
|---|---|---|---|
| Cover Prestripping | $1.00/yd$^3$ | 3,400 yd$^3$ | $ 3,400 |
| Spreading and Compacting (equipment) | $60/hr. | 312 hr. | 18,700 |
| Covering | $1.00/yd$^3$ | 2,800 yd$^3$ | 2,800 |
| Maintenance, Roads and Ditches (equipment) | $60/hr. | 52 hr. | 3,100 |
| Labor, Operator | $5.20/hr. | 2,080 hr. | 10,800 |
| Revegetation | $1,100/acre | .73 acre | 800 |
| Utilities (electricity) | | Lump Sum | 500 |
| | | TOTAL | $40,100 |

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* Sources: Caterpillar (11), Engelsman (12), McMahon (9), and Rental Rate Blue Book (13).

## TABLE 10

## TELLER COUNTY SITE 12: CAPITAL AND ANNUAL OPERATING COSTS *

**Capital Costs** (Trench and Area Methods)

| Item | Unit Cost | Units | Total Cost |
|---|---|---|---|
| Land | $2,000/acre | 40 acres | $80,000 |
| Road Construction | 60,000/mile | .6 mile | 36,000 |
| Shelter (equipment and operator) | 8,200/each | 1 | 8,200 |
| Utilities | $5.00/ft. | 600 ft. | 3,000 |
| Fencing | | | |
| Stock (4 ft.) | $4.10/ft. | 1,450 ft. | 6,000 |
| Litter Fencing (10 ft.) | $10.00/ft. | 400 ft. | 4,000 |
| Drainage Diversion Ditches | $4.00/ft. | 1,500 ft. | 6,000 |
| Miscellaneous | | | 2,000 |
| Engineering and Design (10% of site development cost) | | | 6,500 |
| | | TOTAL | $151,700 + |
| | | AMORTIZED | $ 24,700 + |

**Annual Operating Costs**

| | |
|---|---|
| Trench Method | $51,200✦ |
| Area Method | $40,100✦ |

**Total Annual Cost**

| | |
|---|---|
| Trench Method | $75,900 |
| Area Method | $64,800 |

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* Sources: Caterpillar (11), Godfrey (14), McMahon (9), and Rental Rate Blue Book (13).

+ Using an annual capital recovery factor (CRF) of 0.16275 to determine the uniform annual debt payment at an interest rate of 10 percent over a 10 year period.

✦ The total annual operating cost for a landfill utilized by the entire county (see Tables 8 and 9).

# TABLE 11

## TELLER COUNTY SITE 14: CAPITAL AND ANNUAL OPERATING COSTS*

### Capital Costs (Trench Method)

| Item | Unit Cost | Unit | Total Cost |
|---|---|---|---|
| Land | $2,000/acre | 40 acres | $80,000 |
| Road Construction | $60,000/mile | .2 mile | 12,000 |
| Shelter (for equipment and operator) | $ 8,200/each | 1 | 8,200 |
| Utilities | $5.00/ft. | 800 ft. | 4,000 |
| Fencing Stock (4 ft.) | $4.10/ft. | 2,000 ft. | 8,200 |
| Drainage Diversion Ditches | $4.00/ft. | 2,500 ft. | 10,000 |
| Miscellaneous | | | 2,000 |
| Engineering and Design (10% of site development cost) | | | 4,400 |
| | | TOTAL | $128,800 |
| | | AMORTIZED | $ 21,000+ |

### Annual Operating Costs

| | |
|---|---|
| Trench Method | $51,200‡ |

### Total Annual Cost

| | |
|---|---|
| Trench Method | $72,200 |

---

* Sources: Caterpillar (11), Godfrey (14), McMahon (9), and Rental Rate Blue Book (13).

+ Using an annual capital recovery factor (CRF) of 0.16275 to determine the uniform annual debt payment at an interest rate of 10 percent over a 10 year period.

‡ The total annual operating cost for a landfill utilized by the entire county (see Tables 8 and 9).

## TABLE 12

## TELLER COUNTY SITE 17: CAPITAL AND ANNUAL OPERATING COSTS*

**Capital Costs** (Trench and Area Methods)

| Item | Unit Cost | Units | Total Cost |
|---|---|---|---|
| Land | $2,000/acre | 40 acres | $80,000 |
| Road Construction | $60,000/mile | .2 mile | 12,000 |
| Shelter (for equipment and operator) | $8,200/each | 1 | 8,200 |
| Utilities | $5.00/ft. | 1,200/ft. | 6,000 |
| Fencing | | | |
| Stock (4 ft.) | $4.10/ft. | 1,500 ft. | 6,200 |
| Litter Fencing (10 ft.) | $10.00/ft. | 300 ft. | 3,000 |
| Drainage Diversion Ditches | $4.00/ft. | 2,000 ft. | 8,000 |
| Miscellaneous | | | 2,000 |
| Engineering and Design (10% of site development cost) | | | 4,500 |
| | | TOTAL | $129,900 |
| | | AMORTIZED | $ 21,100+ |

**Annual Operating Costs**

| | |
|---|---|
| Trench Method | $51,200‡ |
| Area Method | $40,100‡ |

**Total Annual Cost**

| | |
|---|---|
| Trench Method | $72,300 |
| Area Method | $61,200 |

---

* Sources: Caterpillar (11), Godfrey (14), McMahon (9), and Rental Rate Blue Book (13).

+ Using an annual capital recovery factor (CRF) of 0.16275 to determine the uniform annual debt payment at an interest rate of 10 percent over a 10 year period.

‡ The total annual operating cost for a landfill utilized by the entire county (see Tables 8 and 9).

## TABLE 13

## TELLER COUNTY SITE 35: CAPITAL AND ANNUAL OPERATING COSTS*

**Capital Costs** (Area Method)

| Item | Unit Cost | Units | Total Cost |
|---|---|---|---|
| Land | $2,000/acre | 20 acres | $40,000 |
| Road Construction | $60,000/mile | .06 mile | 3,600 |
| Shelter (for equipment and operator) | $8,200/each | 1 | 8,200 |
| Utilities | $5.00/ft. | 100 ft. | 500 |
| Fencing | | | |
| Stock (4 ft.) | $4.10/ft. | 1,000 ft. | 4,100 |
| Litter Fencing (10 ft.) | $10.00/ft. | 800 ft. | 8,000 |
| Drainage Diversion, Ditches | $4.00/ft. | 1,100 ft. | 4,400 |
| Miscellaneous | | | 2,000 |
| Engineering and Design (10% of site development cost) | | | 3,100 |
| | | TOTAL | $73,900 |
| | | AMORTIZED | $12,000+ |

**Annual Operating Costs**

| | |
|---|---|
| Area Method | $40,100‡ |

**Total Annual Cost**

| | |
|---|---|
| Area Method | $52,100 |

---

* Sources: Caterpillar (11), Godfrey (14), McMahon (9), and Rental Rate Blue Book (13).

+ Using an annual capital recovery factor (CRF) of 0.16275 to determine the uniform annual debt payment at an interest rate of 10 percent over a 10 year period.

‡ The total annual operating cost for a landfill utilized by the entire county (see Tables 8 and 9).

Drainage diversion ditches will be required at all the sites to eliminate the possibility of generating contaminated run-off which might mix with nearby creeks, streams, or other surface waters. In order to improve surface water diversion, ditches should be dug and located slightly upslope from and along the edges of the area pre-stripped for the landfill. In this way, the ditches prevent water from running onto the landfill and mixing with the refuse. Riprap should be layed down (to prevent erosion) where the ditches empty into the existing drainage channel. Surface water impoundment structures, which further reduce the potential for surface water contamination by collecting water falling directly onto the landfill, will not be needed if the drainage ditches are properly located, constructed and maintained.

The miscellaneous capital cost covers such items as signs and posts, a fire extinguisher, portable sanitation, office equipment, etc.

Even though the life of the sites will vary, capital costs have all been amortized at a 10 percent interest rate over a 10-year period. Most of the sites, however, will last much longer than 10 years if operated efficiently. Site 12, for example, can be trenched for at least 30 years based upon current waste generation volumes and a trench fill at sites 14 and 17 will similarly contain around 30 years of waste. Again, at current waste volumes, an area fill over these previously trenched land surfaces will double the life of the sites. An area fill at site 17 is good for approximately 40 years while an area landfill at site 35 will last roughly 14 years at a 12-foot cell depth. It is recommended that all sites be returned to agricultural use as rangeland following landfill closure. Final cover application and revegetation are part of the closure plan and will make the land suitable for agricultural use.

The operational plan for a landfill (trench or area) in Teller County assumes that all wastes will be delivered to the landfill by services provided by the County's two private waste haulers or by the residents themselves. An operation such as this will enable the private haulers to expand their collection services and further free the County from managing and providing expenditures for solid waste collection.

If the County wishes to assume the additional financial burden of providing County residents with a more convenient and perhaps less costly (to the residents) municipal (non-bulky) waste collection service, greenbox stations can be provided at Florissant, Cripple Creek, and Victor. The additional costs associated with providing this service involve the current greenbox acquisition costs, and the truck or transportation costs involved with moving the municipal wastes from the greenboxes to the Teller County landfill. Sixteen greenboxes will need to be purchased and added to the six already existing at the Florissant greenbox station. It is assumed that collection will occur in 20-cubic yard packer trucks which will compact the waste to a 4:1 ratio. All mileages were calculated assuming a Cripple Creek based greenbox collection service. Greenbox collection in Cripple Creek and Florissant is currently performed by Teller Disposal located in Cripple Creek. Table 14 breaks down the costs included in this supplementary system. If the Florissant greenbox station is closed and the residents of that area haul directly to the landfill, the total annual cost of this system would be reduced to $6,600.

**Cost Comparison: Northern Teller County Landfill vs. Entire County Landfill.** If a landfill is to be operated only for northern Teller County (including Woodland Park, Divide, and Florissant) and does not take in wastes generated in the south, the annual operating costs will decrease by approximately 15 percent. The annual operating cost could thus be reduced from $52,100 to $44,300 for a trench landfill and from $40,100 to $34,100 for an area landfill. The capital costs should not vary from those presented in Tables 10 through 13 for landfills serving the entire County. The decreases in annual operating costs assumes that the hours of the site is open each week will remain the same; a reduction in the number of days the site is open will only slightly further reduce operating costs for a northern Teller County landfill. Because of the large percentage of trash produced in northern Teller County, there will not be a significant cost reduction in operating a landfill for only that portion of the County. The added financial burden that would be imposed by operating two landfills (one in the north and one in the south) greatly reduces the desirability of this alternative.

## B. The Cripple Creek Landfill Disposal Site

Located approximately one mile north of the town of Cripple Creek, the Cripple Creek disposal site currently handles waste from the town and surrounding environs, the Florissant greenbox station, and the Florissant Fossil Beds National Monument. The site was inspected by the Colorado Department of Health (CDH) in February of 1980 and, at that time, was found to be in non-compliance with CDH regulations. Public health and environmental hazards including evidence of potential surface water or ground water pollution, inadequate surface diversion/containment facilities, and safety hazards resulting from inadequate cover, fencing, and burning, were cited in the CDH inspection report. Therefore, the site cannot receive a Certificate of Designation in its present condition. Disposal of waste at the site, at this time, is technically illegal. Meetings with CDH personnel and recent inspections of the site, however, indicate that this site could be upgraded and to comply with State regulations and could then be issued a Certificate of Designation. In a recent letter to the County (see Appendix G), the CDH recommended specific actions, including a cessation of burning and regular cover application that would be necessary to bring the landfill into compliance. If the site undergoes upgrading and is

## TABLE 14

## SUPPLEMENTARY GREENBOX SYSTEM COST SUMMARY (SOUTHERN TELLER COUNTY)

**Capital Costs**

| Item | Unit Cost | Units | Total Cost |
|---|---|---|---|
| Greenboxes (6 yd.$^{3}$.)* | $600/each | 16 | $ 9,600 |
| | | SUBTOTAL | $ 9,600 |
| | | AMORTIZED | 1,600+ |

**Annual Operating Costs**

| Item | Unit Cost | Units | Total Cost |
|---|---|---|---|
| Truck Cost (includes fuel, labor, maintenance, insurance, etc.) | $1.00/mile | 9,600 miles‡ | $ 9,600 |
| | | SUBTOTAL | 9,600 |
| | | TOTAL ANNUAL | $11,200 |

---

* 6 greenboxes in Victor, 8 greenboxes each in Florissant and Cripple Creek.

+ Using a Capital Recovery Factor (CRF) of 0.16275 to determine the uniform annual debt payment at an interest rate of 10 percent over a 10-year period.

‡ 4,000 annual truck miles for Cripple Creek, 1,200 miles for Victor, and 4,400 for Florissant.

properly operated, it could adequately serve the residents of southern Teller County as a sanitary landfill facility over the ten-year study period and longer.

Assuming the site will continue to be leased by the County, the current capital cost necessary to upgrade the site totals approximately $28,600 amortized annual cost of $4,600 (see Table 15). Approximately 1,000 feet of road into the site should be graded and have gravel applied. Fencing needs to be constructed to control access and should be strung along the southern boundary of the site. A gatehouse should be set up for the site operator along the road inside this fence. Because of exposure problems, 300 feet of 10 foot high litter fencing will also be needed. Drainage diversion ditches will again be needed and should be situated as described previously (p. 50). A clay core dam approximately three feet high built in the drainage just downslope from the landfill will contain any run-off from the landfill itself. The runoff water collected in this impoundment will be lost by evaporation leaving any deleterious constituents trapped in the impoundment (and thus out of nearby strems and surface waters). Design parameters include sizing the impoundment for run-off volume of the 10-year, 24-hour storm event, and the potential for flooding during the spring snow melt. The surface water diversion ditches should empty below this impoundment and rip-rap again layed down where the ditches empty into the drainage channel. Finally, the refuse pile should be levelled off and pushed into the existing trench (directly up the drainage from the present location of the refuse pile) and covered. The car bodies (if they cannot be sold as scrap metal), white goods, and other bulky material should also be flattened and disposed of in this trench. Possible scrap metal markets in the Pueblo and Colorado Springs areas should be explored in order to dispose of these car bodies. It is assumed that the flattening and burial of white goods and other bulky material will only require the time of the bulldozer and operator to run the dozer over this material and cover it. It is expected that little or no revenue will be generated as a result of the sale of the scrapped car bodies due to the transportation costs to the scrap metal markets. The sale of these car bodies will, however, eliminate the cost of landfilling them.

The capital (or upgrading) and annual operating costs for the Cripple Creek disposal site are listed in Table 15. In the annual operating costs, it is assumed that adequate cover material will be available on-site. Observing the white goods trench at the landfill indicates that rippable cover material may be present at a depth of six feet or more. If a sufficient amount of cover material is not present, it can be purchased for approximately $2.15 a cubic yard (includes labor and equipment costs). With a current annual cover material requirement (intermediate and final) of 700 $yd^3$ (see Appendix F for calculations), the added cost of transporting cover to the site would be around $1,500 a year (not included in cost table). An operator will be needed to maintain the site and collect user fees. The operator will have to be present at all times

## TABLE 15

## CRIPPLE CREEK LANDFILL: CAPITAL AND ANNUAL OPERATING COSTS*

### Capital Costs

| Item | Unit Cost | Units | Total Cost |
|---|---|---|---|
| Road Improvement+ | \$11.40/ft. | 1,000 ft. | \$11,400 |
| Fencing | | | |
| 4 ft. Stock+ | \$4.10/ft. | 1,000 ft. | 4,100 |
| Litter Fencing+ | \$10.00/ft. | 300 ft. | 3,000 |
| Drainage Diversion | | | |
| Ditches+ | \$1.00/ft. | 1,000 ft. | 1,000 |
| Impoundment | \$1.00/yd.$^3$ | 1,000 yd.$^3$ | 1,000 |
| Shelter+ | \$2,000/each | 1 | 2,000 |
| Utilities+ | \$5.00/ft. | 400 ft. | 2,000 |
| Site Improvement (leveling refuse pile, white goods, etc.) | \$65/hr. | 32 hr. | 2,100 |
| Miscellaneous+ | | | 2,000 |
| | | SUBTOTAL | \$28,600 |
| | | AMORTIZED | \$ 4,600‡ |

### Annual Operating Costs

| | | | |
|---|---|---|---|
| Land, Lease | \$1,500/acre | 10 acres | \$15,000 |
| Cover Prestripping | \$1.00/yd.$^3$ | 1,000 yd.$^3$ | 1,000 |
| Spreading and Compacting (equip. and labor) | \$65/hr. | 52 hr. | 3,400 |
| Covering | \$1.00/yd$^3$ | 700 yd.$^3$ | 700 |
| Maintenance, Roads and Ditches (equip. and labor) | \$65/hr. | 52 hr. | 3,400 |
| Labor (in addition to equip. operation) | \$5.20/hr. | 1,200 hr. | 6,200 |
| Revegetation | \$1,100/acre | .2 acre | 200 |
| | | TOTAL | \$29,900 |
| | | TOTAL ANNUAL | \$34,500 |

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* Sources: Caterpillar (11), Engelsman (12), McMahon (9), and Rental Rate Blue Book (13).

+ Not required by the CDH to upgrade the site.

‡ Using an annual capital recovery factor (CRF) of 0.16275 to determine the annual debt payment at an interest rate of 10 percent over 10 years.

when the site is open for use. At the end of each working day the operator will move the waste, compact it and apply cover material. Considering the relatively small amount of waste being generated, the landfill will only need to be open five afternoons each week. The landfill should be open on Saturday in order to be more accessible to area residents.

## VII. EVALUATION OF TRANSFER ALTERNATIVES

If land in Teller County is unavailable due to owner disapproval, prohibitive costs, or incompatibility with adjacent land uses, then it would be advantageous to transport or transfer wastes out of the County for ultimate disposal. For this option to be most economically implemented, transportation costs must be reduced to a minimum. One method to reduce transportation costs is to utilize a transfer station where solid wastes are temporarily deposited and then transferred to large capacity vehicles (usually a semi-trailer with the capacity to transport up to 20 tons of waste). These large vehicles, in turn, transport the waste to a regional disposal site.

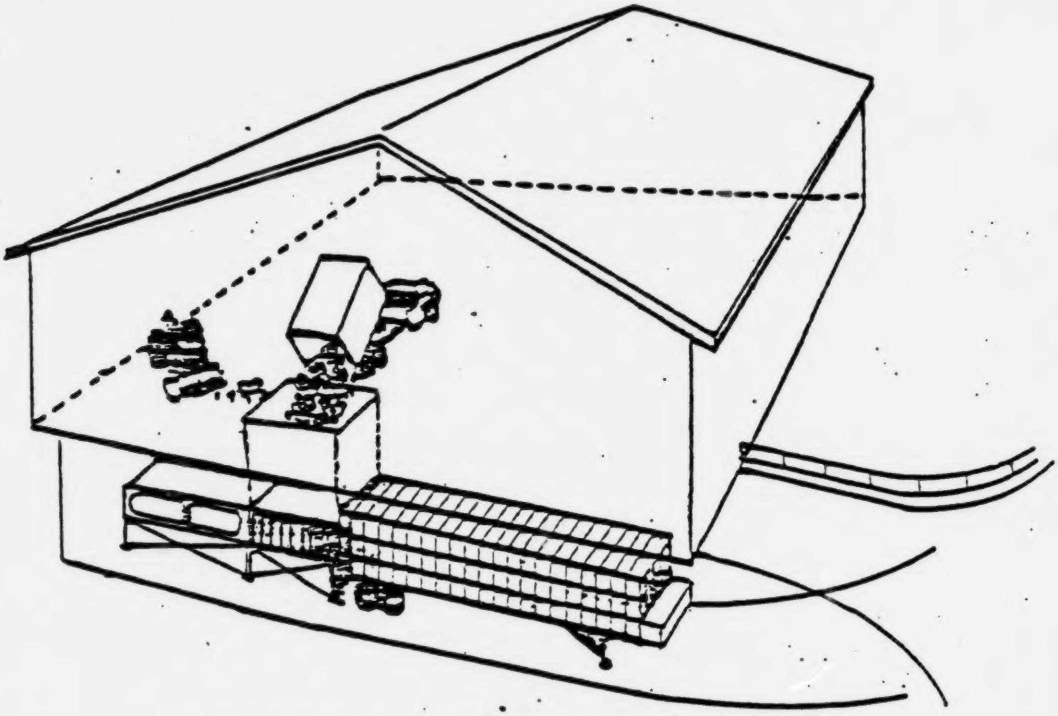
There are advantages and disadvantages in the utilization of a solid waste transfer system as compared to a landfill operation. Waste transfer would eliminate the cost and difficulty of acquiring valuable land in the County, provide an immediate solid waste disposal facility, and lessen public opposition to the initiation of a new landfill site. On the other hand, a transfer station in Teller County would require a dependence on waste disposal facilities in El Paso County which might be exhausted in the near future.

As outlined in the scope of work, two different systems will be analyzed: 1) directly hauling waste out of the County in packer-type collection vehicles without the use of transfer stations (essentially the present system for northern Teller County); and 2) hauling waste out of the County after it has been compacted in a County transfer station. The first system, although technically not a transfer option because no tranfer station is involved, will nevertheless be discussed in this chapter. These two options will be compared using both the total volume of waste generated in the entire County and for the total amount of waste that is produced in northern Teller County only (i.e. - in Woodland Park, Divide, and Florissant). A general review of transfer methodologies will preceed that discussion.

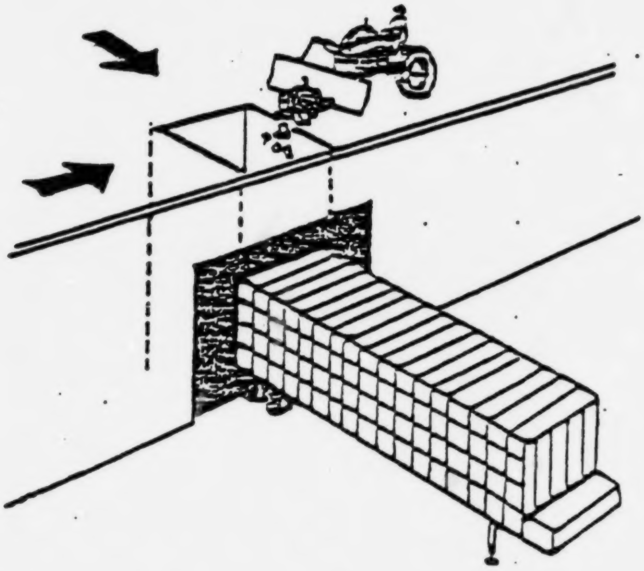
### A. General Review of Solid Waste Transfer Options

**Transfer Stations.** Transfer stations are commonly designed to function in one of two ways (see Figure 7). One method is direct transfer (direct dump) of the wastes from the collection vehicles to the larger capacity transfer trucks. The second method (stockpile/front end load) consists of stockpiling the wastes from the collection vehicles and periodically moving the stockpiled wastes into the transfer vehicle. Generally in cases involving small daily waste loads on the order of 50 tons per day (TPD) or less, direct transfer of the wastes is the most cost-effective alternative. Larger volume transfer stations---50 to 250 TPD---usually utilize the stockpile method plus sophisticated transfer equipment

**FIGURE 7. TRANSFER STATIONS***



DIRECT DUMP TRANSFER STATION



STOCKPILE / FRONT END LOAD TRANSFER STATION

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*SOURCE: HEGDAHL (15).

Additionally, transfer stations of this size have the potential to implement limited resource recovery operations (e.g. paper and aluminum can separation and recycling) to offset capital and operating costs. Transfer stations with various arrangements of optional equipment are commercially available from a number of nationwide manufacturers, some of whom offer turn-key services.

**Compaction Unit.** In general, areas where populations exceed 1,000 or where transportation distances exceed approximately 15 miles, it is most economical and practical to have the transfer station equipped with a compaction unit to reduce the volume of the waste. This allows for a substantial increase in the quantity of waste which can be transported each trip and thus decreases the number of vehicle trips taken to the ultimate disposal site.

**Transfer Vehicles.** There are two types of transfer vehicles which can be used with compaction equipment. These are the tilt frame/roll-off container vehicle, and the transfer trailer.

The tilt frame/roll-off is so named because of the moveable rail structure which is mounted directly on the truck chassis or separately on a trailer bed (see Figure 8). A roll-off container is collected by "tilting" the rails and winching the entire container onto the structure. When the container is to be emptied, the rear doors of the container are opened and the entire package is tilted so that the compacted refuse falls out. Commercially available tilt frame/roll-off transfer vehicles must be equipped with a separate refuse compactor. Refuse is deposited in a hopper feeding the compactor which forces the waste into the roll-off container. There is little compaction of refuse until the container is nearly full since, only then does the compactor exert a signficant pressure. A typical ratio of compacted to loose refuse density achieveable by this type of system is 1.9 to 1 by weight.

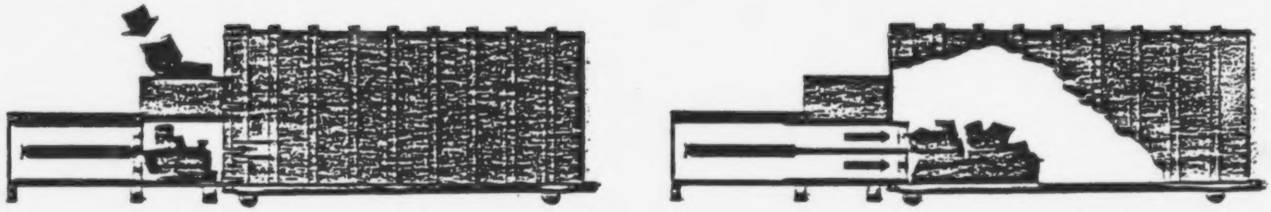
In contrast to the external compactor associated with the tilt frame/roll-off type of trailer, the transfer trailer has a hydraulic ejection ram mounted inside the trailer compartment (see Figure 9). When emptying the trailer, the rear doors are opened and refuse is pushed out by the ram. This ram provides a signficant advantage for the transfer trailer as opposed to the roll-off system. The ram allows the transfer trailer to achieve a much higher density of wastes in one of two ways. If a separate compactor is utilized, it can work against the ejection ram which is extended at first and gradually retracted as the volume of contained wastes increases. Alternatively, the ejection ram can be used as a compaction device. In this system, wastes are introduced via a hopper into a "top dumping" trailer just behind the face of the ram. When a certain volume has been deposited, the operator can use the ram to compact the wastes against the rear door of the trailer. The advantage of this method is

## FIGURE 8.

## TILT FRAME/ROLL-OFF TRANSFER VEHICLE*

1.

2.

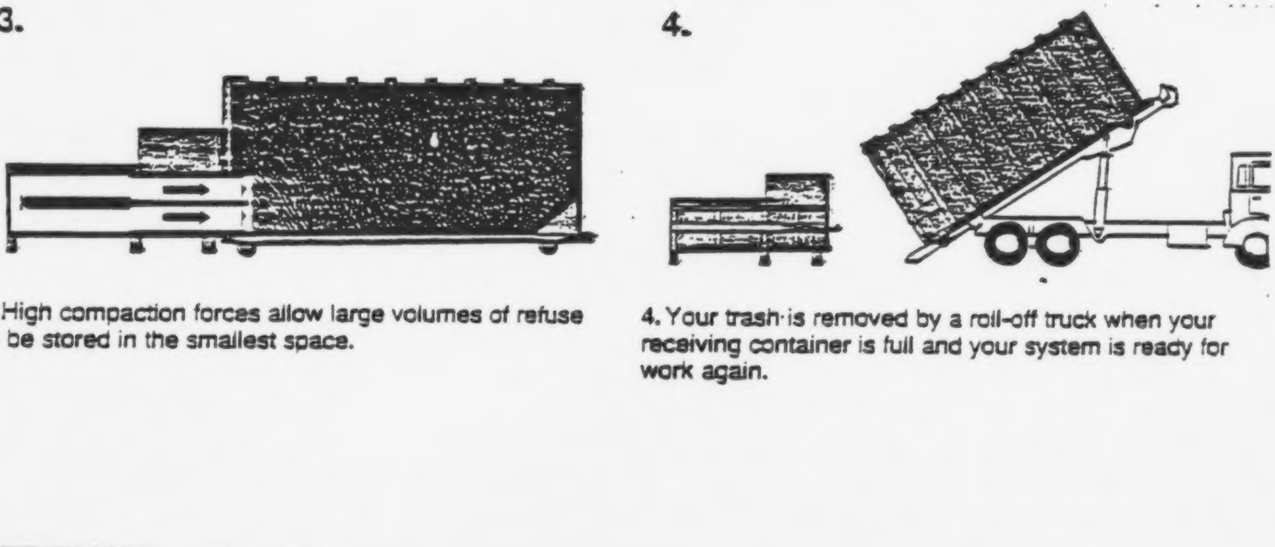


1. Refuse is inserted into the compactor hopper by various methods. Loading procedure can be selected to best suit each installation.

2. Simply activate pushbutton control and your trash is compacted and stored in a sanitary, closed system.

3.

4.



3. High compaction forces allow large volumes of refuse to be stored in the smallest space.

4. Your trash is removed by a roll-off truck when your receiving container is full and your system is ready for work again.

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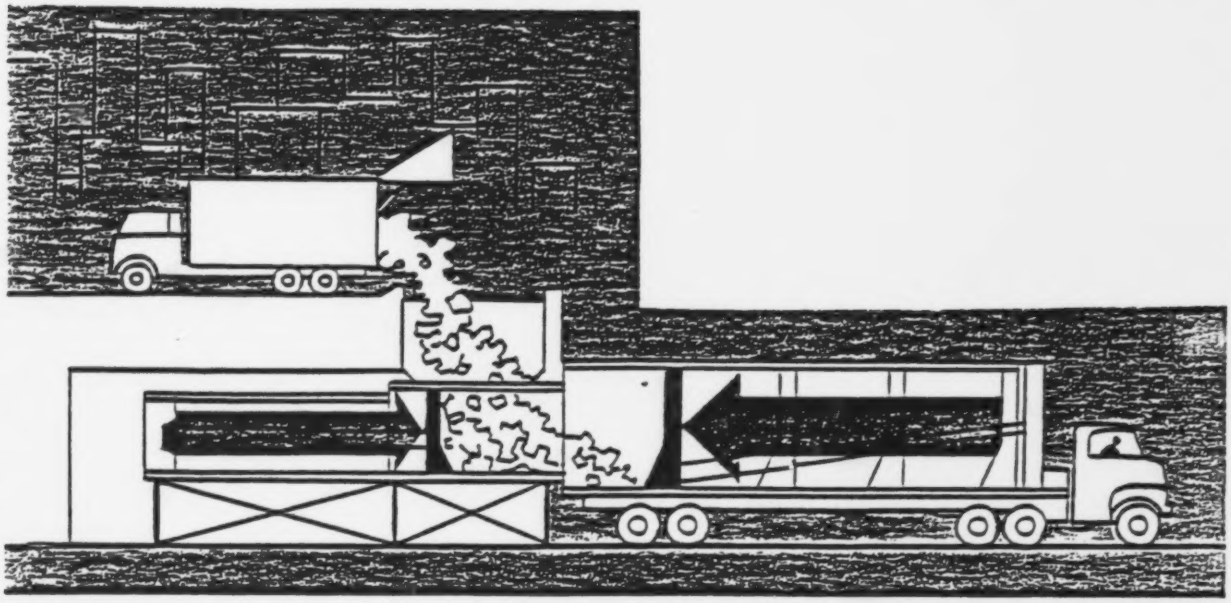
*SOURCE: DEMPSTER DUMPSTER SYSTEMS, KNOXVILLE, TENNESSEE

FIGURE 9. TRANSFER TRAILER VEHICLE*



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*SOURCE: DEMPSTER DUMPSTER SYSTEMS, KNOXVILLE, TENNESSEE that no separate piece of compaction equipment is required. All that the trailer requires is a source of hydraulic pressure which can be provided through a "wet-pack" hookup from the tractor rig or a stationary hydraulic pump (gas or electric). A typical ratio of compacted to loose refuse density achievable by this type of system is 3 to 1 by weight.

**"Greenbox" System.** One type of system that is often used effectively in conjunction with a transfer station is a rural disposal or "greenbox" collection system. For rural areas and communities with populations less than approximately 1,000 where no individual door-to-door collection service is available, a potentially economical solid waste collection alternative is the use of containers strategically placed throughout the service area. Through the use of specially-equipped vehicles, these containers, referred to as greenboxes, are emptied periodically and the waste is then transported to a landfill, or a central transfer facility to await final transportation and disposal at a regional disposal site. In many rural areas, a container system has replaced several small indiscriminate dumps allowing for an economical waste disposal method which is in compliance with all local, State, and Federal laws.

The "greenbox" system consists of locating several small containers (see Figure 10) varying from 3 to 8 cubic yards in size throughout a sparsely populated area. These containers are placed in locations which are readily accessible including intersections of local highways, recreational areas, previous dumpsites, and in or near small communities. These container systems can be designed such that the waste in the containers can be emptied into either a front loading or rear loading waste collection vehicle (see Figure 11).

The greenbox system would require special County-wide ordinances to control the type of waste being deposited in these greenboxes. Such ordinances would have to address the fact that:

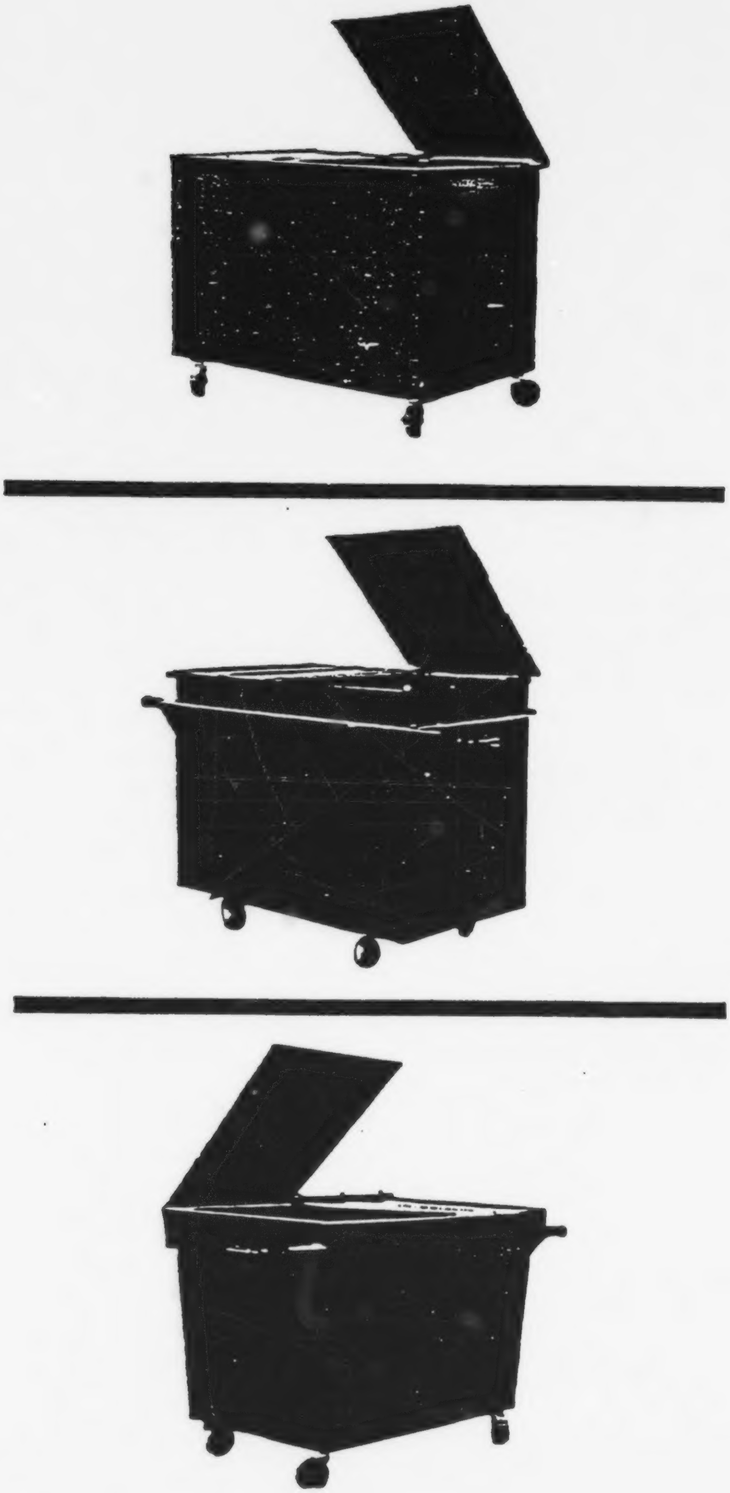
a) Containers can accept:

- residential and household waste
- light commercial waste
- yard trimmings

b) Containers cannot accept:

- burned or burning materials
- industrial waste
- bulky waste; i.e., stoves, refrigerators, construction debris, tree trunks, auto parts, etc.
- dead animals.

FIGURE 10. GREENBOXES*



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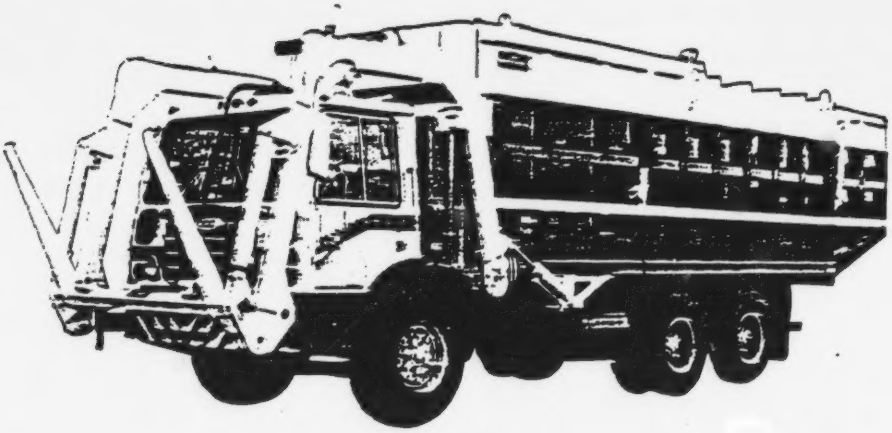
*SOURCE: GEORGE SWANSON AND SON, INC., ARVADA, COLORADO

# FIGURE 11.

## FRONT*AND REAR-LOADING†GREEN BOX COLLECTION VEHICLES



*SOURCE: PERFECTION - COBEY CO., GALION, OHIO

Reproduced from
best available copy.

†SOURCE: DEPSTER DUMPSTER SYSTEMS, KNOXVILLE, TENNESSEE

Collection vehicle and transfer station systems will be analyzed and compared in the discussion that follows. In the collection vehicle option, compactor trucks will collect municipal non-bulky wastes from greenbox stations and bulky wastes will be transported in a tilt-frame roll-off container. The transfer station option involves direct dumping into tilt-frame roll-off containers (for municipal and bulky wastes) with the municipal waste roll-off being attached to a compactor unit. In the second option, the municipal wastes will again be collected from a satellite system of greenbox stations. Tilt-frame roll-off containers are recommended over transfer trailers because of the increased capital investment associated with the latter equipment. Additionally, most private solid waste disposal companies in the region utilize tilt-frame roll-off trucks and containers.

## B. Collection Vehicle System

The first system analyzed involves the direct transfer of waste to El Paso County via packer-type collection vehicles and approximates current waste management practices in the northern Teller County. The analysis of this system for the entire County, however, assumes that the Cripple Creek and Victor landfills would be closed and replaced with greenbox stations. The Divide and Florissant greenbox stations would continue their current operations. Figure 12 utilizes a matrix arrangement to illustrate the collection vehicle and transfer options. It is assumed that waste collection services will continue to be based in the Woodland Park and Cripple Creek areas.

In the analysis for northern Teller County only, it is assumed that the Cripple Creek landfill would be upgraded and the Victor disposal site closed and replaced with greenboxes (which would be hauled to the Cripple Creek landfill). Waste collection in the Florissant area is, however, figured into the analysis for northern Teller County and the disposal of these wastes would occur in an El Paso County landfill rather than in the Cripple Creek landfill. The waste from the greenbox stations in Divide and Florissant, as well as the commercial and residential wastes already collected by the Woodland Trash Service and Teller Disposal, Inc. in northern Teller County would be hauled directly to a landfill in El Paso County without the benefit of compaction in a centrally located transfer station. Solid waste disposal costs incurred in southern Teller County are not included in the cost summary table for northern Teller County only. The dispersion of greenbox stations near the population centers would make waste disposal more accessible to County residents. In these transfer analyses, it is assumed that waste generated on U.S. Forest Service (USFS) lands would continue to be collected and disposed of by that agency. It should be pointed out, however, that USFS wastes collected at a Teller County transfer station would generate additional revenue for Teller County.

# FIGURE 12

## SUMMARY OF COLLECTION VEHICLE AND TRANSFER OPTIONS FOR TELLER COUNTY

### Collection Vehicle Option

| Entire County | Woodland Park | Divide | Florissant | Cripple Creek | Victor |
|---|---|---|---|---|---|
| Sanitary Landfill | | | | | |
| Greenboxes | | X | X | X | X |
| Transfer Station | | | | | |
| Municipal Waste Roll-Off | | | | | |
| Rubble Roll-Off* | | | | | |

| Northern Teller County | Woodland Park | Divide | Florissant | Cripple Creek | Victor |
|---|---|---|---|---|---|
| Sanitary Landfill | | | | X | X |
| Greenboxes | | X | X | | |
| Transfer Station | | | | | |
| Municipal Waste Roll-Off | | | | | |
| Rubble Roll-Off* | | X | | | |

### Transfer Station Option

| Entire County | Woodland Park | Divide | Florissant | Cripple Creek | Victor |
|---|---|---|---|---|---|
| Sanitary Landfill | | | | | |
| Greenboxes | | | X | X | X |
| Transfer Station | X | | | | |
| Municipal Waste Roll-Off | X | | | | |
| Rubble Roll-Off* | X | | | | |

| Northern Teller County | Woodland Park | Divide | Florissant | Cripple Creek | Victor |
|---|---|---|---|---|---|
| Sanitary Landfill | | | | X | X |
| Greenboxes | | | X | | |
| Transfer Station | X | | | | |
| Municipal Waste Roll-Off | X | | | | |
| Rubble Roll-Off* | X | | | | |

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* The rubble roll-off container would only be at the site for 3 months a year for the entire county system and 2 months for the northern county system.

Knowing the approximate cubic yardage of waste produced each week at each site, one can juggle the number of greenboxes against the frequency of collection to ensure adequate collection coverage. It is assumed that most residential customers in the Cripple Creek area will utilize the greenbox station located there.

Two more 6-cubic yard greenboxes would be added to the four 6-cubic yard greenboxes already located at the Divide greenbox station and two more 6-cubic yard boxes would be added to the six located at Florissant. Greenbox stations at Cripple Creek (eight 6-cubic yard boxes) and Victor (six 6-cubic yard boxes) would replace the landfills there. Collection frequency currently runs at about 3 collections per week at Divide and 3 per week at Florissant. Approximately 3 collections per week will be needed at the Cripple Creek station and 1 weekly collection at Victor.

The capital costs included in this option are the greenbox, fencing, and miscellaneous costs. Approximately 800 feet of fencing would be required at three of the sites (the Divide site is already fenced). The miscellaneous capital cost covers signs, portable sanitation, a fire extinguisher, office equipment, etc.

Annual operating costs include truck costs, landfill tipping fees, and site maintenance. Truck costs include ownership costs, fuel, labor, maintenance, insurance, etc. on the collection vehicles utilized (20-cubic yard packer trucks with a 4:1 compaction ratio). Although the current landfill tipping fee in Colorado Springs is $1.10/yd.$^3$, the cost summary quotes a $1.50/yd.$^3$ figure in order to anticipate expected rate increases and to account for the dumping of partial loads. Partial truck loads of waste are charged as full loads because rates apply to the capacity of the collection vehicle. Site maintenance costs refer to the cost of hiring someone to open and close the greenbox station gate daily and to periodically collect windblown and misplaced debris. No additional supervision of the sites during the day is necessary. In a system designed for the entire County, 87 percent of the total cost (capital and annual operating) will involve truck costs and landfill tipping fees. With a system operating only in the north, 89 percent of the total cost will involve truck costs and landfill tipping fees.

Bulky wastes (i.e., stoves, refrigerators, construction debris, tree trunks, auto parts, etc.) cannot be placed into the boxes and therefore a special provision must be formulated for their collection. It is recommended that a well-publicized bi-annual collection program be instituted. The County could lease a 60-cubic yard open-top roll-off container into which residents could deposit their bulky wastes for ultimate disposal in El Paso County. Leasing is usually arranged on a monthly basis. It is recommended that this collection program be operated during the spring and late summer/early fall season when most of the rubble accumulates.

In the calculation of truck mileage figures (incorporated into the truck costs), it was assumed that private hauling operations would continue to be based in Woodland Park and Cripple Creek and would maintain the collection routes currently serviced. The truck mileage figures include both the miles involved with driving collection vehicles to the greenbox stations to collect the wastes, and transporting the municipal wastes (in collection vehicles) and bulky material (roll-off containers) to a landfill in El Paso County. Door-to-door collection by the private haulers and the transporting wastes by residents to the greenbox stations are not included.

The fuel costs involved in operating the collection vehicles represent roughly 22 percent of the truck costs or 12 percent of the total cost of this alternative. If fuel costs were to double, this would increase the total system cost by approximately 10 percent.

The costs associated with this transfer arrangement are itemized in Tables 16 and 17. Total site development costs and annual operating costs ware subdivided into the costs for such a system for the entire County (Table 16), and for only the northern part of the County including Woodland Park, Florissant, and Divide (Table 17).

## C. Transfer Station System

In Teller County, a transfer station can be located in Woodland Park to service the entire County population. From an operational standpoint, the County's two private haulers would continue to operate as before, only with this system they would deposit their collected trash at the Woodland Park transfer station rather than at landfills in Colorado Springs (Woodland Trash Service) and Cripple Creek (Teller Disposal, Inc.). Again the establishment of a satellite system of greenbox stations one each at Florissant (existing), Cripple Creek, and Victor would be necessary to make waste collection more accessible to County residents. Residents in and around Divide and Woodland Park could haul their wastes directly to the transfer station.

Tables 18 and 19 present cost analyses for the transfer station discussed above, for the entire County, and for northern Teller County only, respectively. As presented here, the County would purchase one 40-cubic yard open-top roll-off container for bulky wastes, and one 60-cubic closed container to handle municipal wastes. The municipal waste roll-off container would be outfitted with a compactor (20-cubic yard hopper) to reduce waste volume and reduce the number of transfer hauls. The compactor would have to be covered to protect it from the elements. In order to provide a stable base for this container and its compactor, a concrete pad (15 ft. X 35 ft.) would be constructed. The concrete pad is necessary for the compaction operation and therefore would not be

## TABLE 16

## COLLECTION VEHICLE TRANSFER SYSTEM COST SUMMARY (ENTIRE COUNTY)*

### Capital Costs

| Item | Unit Cost | Unit | Total Cost |
|---|---|---|---|
| Greenboxes+ (6-yd.$^3$) | $600/each | 18 | $10,800 |
| Fencing | | | |
| 4 ft. Stock | $4.10/ft. | 2,400 ft. | 9,900 |
| Gate | $350/each | 3 | 1,100 |
| Miscellaneous | | | 2,000 |
| | | SUBTOTAL | $23,800 |
| | | AMORTIZED | 3,900‡ |

### Annual Operating Costs

| | | | |
|---|---|---|---|
| Truck Costs (includes ownership cost, fuel, labor, maintenance, insurance, etc.) | $1.00/mile | 39,000 miles | $39,000 |
| Roll-Off Container (60 yd.$^3$) | | | |
| Leasing | $200/month | 3 months | 600 |
| Transport | $100/trip | 33 trips | 3,300 |
| Landfill Tipping Fees (municipal and bulky wastes) | $1.50/yd.$^3$ | 16,400 yd.$^3$ | 24,600 |
| Site Maintenance | $3.50/hr. | 143 hrs./site w/4 sites | 2,000 |
| | | SUBTOTAL | $ 69,500 |
| | | TOTAL ANNUAL | $ 73,400 |

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* Sources: McMahon (9) and Rental Rate Blue Book (13).

+ 8 greenboxes at Cripple Creek, 6 greenboxes at Victor, and 2 greenboxes added to each of the existing greenbox stations located at Divide and Florissant.

‡ Using a Capital Recovery Factor (CRF) of 0.16275.

## TABLE 17

## COLLECTION VEHICLE SYSTEM COST SUMMARY

## (NORTHERN TELLER COUNTY)*

### Capital Costs

| Item | Unit Cost | Unit | Total Cost |
|---|---|---|---|
| Greenboxes (6-yd.$^3$)+ | $600/each | 4 | $2,400 |
| Fencing | | | |
| $4.10/ft. Stock | $4.10/ft. | 800 ft. | 3,300 |
| Gate | $350/each | 1 | 350 |
| Miscellaneous | | | 2,000 |
| | | SUBTOTAL | $8,100 |
| | | AMORTIZED | $1,300‡ |

### Annual Operating Costs

| | | | |
|---|---|---|---|
| Truck costs (includes ownership cost fuel, labor, maintenance, insurance, etc. | $1.00/mile | 24,700 miles | $24,700 |
| Roll-off container (60-yd.$^3$) | | | |
| Leasing | $200/month | 2 months | 400 |
| Transport | $100/trip | 24 trips | 2,400 |
| Landfill Tipping Fees (Municipal and bulky wastes) | $1.50/yd.$^3$ | 12,200 yd.$^3$ | 18,300 |
| Site Maintenance | $3.50/hour | 143 hrs./site w/2 sites | 1,000 |
| | | SUBTOTAL | $46,800 |
| | | TOTAL ANNUAL | $48,100 |

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* Sources: McMahon (9) and Rental Rate Blue Book (13).

+ 2 greenboxes added to each of the existing greenbox stations at Divide and Florissant.

‡ Using Capital Recovery Factor (CRF) of 0.16275.

## TABLE 18

## TRANSFER STATIONS SYSTEM COST SUMMARY (ENTIRE COUNTY)*

### Capital Costs

| Item | Unit Cost | Unit | Total Cost |
|---|---|---|---|
| Greenboxes (6-yd.$^3$)+ | $ 600/each | 16 | 9,600 |
| Roll-off Containers | | | |
| (60-yd.$^3$) | $ 5,500/each | 1 | 5,500 |
| (40-yd.$^3$) | $ 3,800/each | 1 | 3,800 |
| Compactor (20-yd.$^3$ hopper) | $10,000/each | 1 | 10,000 |
| Skid Loader | $10,000/each | 1 | 10,000 |
| Site Development (includes shelter, concrete pad, ramp and retaining wall, fencing, etc.) | | | 30,000 |
| Miscellaneous | | | 3,500 |
| | | SUBTOTAL | 72,400 |
| | | AMORTIZED | 11,800‡ |

### Annual Operating Cost

| Item | Unit Cost | Unit | Total Cost |
|---|---|---|---|
| Labor, Operator | $5.20/hour | 2,080 hours | 10,800 |
| Truck Costs (includes fuel, labor maintenance, insurance, etc.) | $1.00 /mile | 22,800 miles | 22,800 |
| Landfill Tipping Fees | $1.50/yd.$^3$ | 16,400 yd. | 24,600 |
| | | SUBTOTAL | $ 58,200 |
| | | TOTAL ANNUAL | $ 70,000 |

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* Sources: McMahon (9) and Rental Rate Blue Book (13).

+ 8 greenboxes at Cripple Creek, 6 greenboxes at Victor, and 2 greenboxes added to the existing Florissant greenbox station.

‡ Using a Capital Recovery Factor (CRF) of 0.16275.

## TABLE 19

## TRANSFER STATION SYSTEM COST SUMMARY (NORTHERN TELLER COUNTY)*

### Capital Costs

| Item | Unit Cost | Unit | Total Cost |
|---|---|---|---|
| Greenboxes (6-yd.$^3$)+ | $ 600/each | 2 | 1,200 |
| Roll-off Containers | | | |
| (60-yd.$^3$) | $ 5,500/each | 1 | 5,500 |
| (40-yd.$^3$) | $ 3,800/each | 1 | 3,800 |
| Compactor (20-yd.$^3$ hopper) | $10,000/each | 1 | 10,000 |
| Skid Loader | $10,000/each | 1 | 10,000 |
| Site Development (includes shelter, concrete pad, ramp and retaining wall, fencing, etc.) | | | 30,000 |
| Miscellaneous | | | 2,000 |
| | | SUBTOTAL | 62,500 |
| | | AMORTIZED | 10,200‡ |

### Annual Operating Costs

| Item | Unit Cost | Unit | Total Cost |
|---|---|---|---|
| Labor, Operator | $5.20/hr. | 2,080 hrs. | 10,800 |
| Truck Costs (includes fuel, labor, maintenance, insurance, etc.) | $1.00/mile | 14,100 mi. | 14,100 |
| Landfill Tipping Fees | $1.50/yd.$^3$ | 13,300 yd. | 20,000 |
| | | SUBTOTAL | $44,900 |
| | | TOTAL ANNUAL | $55,100 |

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* Sources: McMahon (9) and Rental Rate Blue Book (13).

+ 2 greenboxes added to the existing Florissant greenbox station.

‡ Using a Capital Recovery Factor (CRF) of 0.16275

required as a base for the rubble container in which wastes are not compacted. A bermed roadway with a curb would have to be constructed to allow waste collection vehicles to dump directly into the top of the roll-off containers. A retaining wall would support the roadway. Additionally, a skid loader would have to be purchased to facilitate the loading of wastes into the roll-off containers. This piece of machinery if skillfully operated could also be used for site maintenance and snow removal. The waste transfer would again be contracted out to a private hauler.

It is more advantageous for the County to purchase rather than lease the required transfer equipment. Leasing the equipment is not possible for a 10 year span due to equipment depreciation (leases usually run much shorter). Also, if equipment is leased, the County would not own the equipment at the end of the lease term.

The fuel costs associated with this transfer station system (for the entire County) represent approximately 22 percent of the truck costs or 7 percent of the total cost of this alternative. As mentioned previously, 12 percent of the total cost of the Teller County collection vehicle system would be fuel costs. If fuel costs were to double, this would only increase the total system cost by roughly 7 percent.

As can be observed from these analyses, it is only slightly less expensive to utilize a transfer station system (total annual cost $70,000) than a collection vehicle transfer system (total annual cost $73,400) for the entire County. The reduction in truck costs resulting from the use of large capacity roll-off containers at the transfer station is offset by the increased capital outlay, primarily site development and equipment costs, involved with this option.

## VIII. EVALUATION OF RESOURCE RECOVERY

Resource recovery such as separation and sale of paper products and aluminum cans can and should be implemented for certain domestic wastes within the County. However, the nature of the composition of wastes generated by the County does not indicate that large scale resource recovery systems will completely solve the immediate or long-term disposal of solid waste within Teller County.

A materials recovery program based on source separation could, however, divert as much as thirty per cent of the waste stream from the transfer system or landfill disposal in the County. The County should carefully evaluate the technical and economical aspects of a resource recovery program in Teller County. The following is presented as a starting point for that analysis.

The market value of all recyclable materials in the Teller County waste stream, based on the percentages and prices shown in Table 20, is estimated at $103,900. Historically, a high resource recovery rate is not achievable, and a more reasonable estimate, of gross value, based on recovering 10 to 20 percent of the waste stream, would be twelve to twenty-four thousand dollars. From this value, the debt service, operation and maintenance costs, and operator's overhead and profit (if any) must be subtracted to calculate a net value. Frequently, source separation programs operate at a loss, and must be subsidized by the sponsoring entity to some extent. However, in Teller County, a subsidy might be acceptable if it was less than or equal to the cost of disposing a similar proportion of waste via transfer or landfilling.

There are four common types of source separation programs (16). The first and most popular, although least effective, is the paper drive. This kind of program, because of its infrequent occurrence and the fluctuating paper market, will normally divert less than 1 percent of the total waste stream.

Drop-off centers, the second type of source separation program, are gaining popularity, and can divert between two and five percent of the wastes in an extensive well-run program. It will normally be less effective than this because of the so called inconvenience factor---the reluctance of people to transport recyclable materials from their homes to a drop-off center.

The buy-back program, a variant of the drop-off center, is the third approach. The most common buy-back material is aluminum, because of its high market value. This alternative partially mitigates the inconvenience factor in the drop-off center; however, it introduces a cash flow problem.

## TABLE 20

## GROSS VALUE OF RECYCLABLE MATERIALS, TELLER COUNTY (1981)*

| | Percent of Waste Stream | Tons Per Year | Current Market Price | Gross Value |
|---|---|---|---|---|
| Paper and Glass | 41 | 2,330 | $30/ton | $ 69,900 |
| Ferrous Metal | 7 | 400 | $10/ton | $ 4,000 |
| Aluminum | 1 | 60 | $500/ton | $ 30,000 |
| TOTAL | | | | $103,900 |

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* Based on a total annual waste stream in Teller County of 5,680 tons.

The fourth and most effective approach is curb-side collection. A newsprint collection system can recover as much as five to eight percent of the total waste, and multi-material collection as much as ten to fifteen percent. However, curb-side collection requires specialized equipment, additional collection labor, and community participation for successful implementation.

In addition, a combination of two or more of the above approaches can provide still further options to the County. For instance, the buy-back of aluminum cans at a drop-off center might be paired with newsprint collection for more optimal resource recovery.

Another factor to consider is the division of operational responsibility among public and private organizations. In Teller County, the private collectors might be reluctant to invest in the equipment required for curb side collection or may be reluctant to expand operation without sufficient financial guarantee. One method of dealing with this problem is the governmental franchise in which collection is provided by private entity under contract to a city or county government, which then sells the recovered materials, under contract, to a buyer. In this manner, the government agency can encourage recovery activities without incurring too much liability.

In summary, the best potential for materials recovery in the County appears to be multi-material source separation of paper (probably newsprint), glass, and aluminum. Transportation is the biggest unknown cost and could reduce or eliminate revenue from the sale of materials. Coordination with any El Paso County recycling programs might reduce this to a manageable cost. For the successful implementation of any recycling program, an extensive effort must be made to increase public awareness and involvement in the program. For at least the first year, the County should expect to subsidize the program to some extent. The personal involvement of county officials and careful monitoring of costs are mandatory for the implementation of a successful program.

## IX. RECOMMENDATIONS AND CONCLUSIONS

In previous sections, alternative waste management systems for Teller County have been evaluated in terms of their cost and efficiency in resolving the County's immediate waste management needs. Landfilling, either by trench or area fill methods, and transfer, involving direct collection vehicle hauling or transfer station compaction and hauling, were analyzed for both the entire County and for northern Teller County only. The alternatives previously discussed provide nearly equal levels of service to County residents. However, the costs and effectiveness of the systems will vary greatly (see Table 21). It should be emphasized that the operating costs presented in Table 21 are not necessarily direct cost to the County. If a private operator runs the collection and/or disposal system, this operator would incur part of these costs. Resource recovery should be evaluated in tandem with the previously mentioned alternatives in order to create a cost-effective and environmentally sound solid waste management system in Teller County.

### A. Landfilling

Following a detailed investigation of the County's lands, it was determined that there are five potentially suitable landfill sites in the County; the fifth site was the current Cripple Creek disposal site which can only contain the volume of wastes produced in the present service area of Teller Disposal, Inc. (Cripple Creek, Victor, Florissant). Of the four potential new landfill locations, sites 14 and 35 scored highest in the quantitative review process. Although more expensive from a capital investment and operational standpoint, site 14 is the more desirable of the two based on the larger land area of this site (40 acres). A larger land area will increase the useful life of the site and provide flexibility to the landfill operation (greater buffer zone, increased potential for on-site cover procurement, etc.).

Historically, landfilling has been the most inexpensive and widely used solid waste disposal alternative in the West. In Teller County, it will cost between $9.20 and $13.40 a ton to dispose of landfilled waste at a single county landfill depending on the size, management, and operation of the landfill. The total annual cost for a Teller County landfill (for the entire County) varies from a $52,100 a year for an area landfill at site 35 to $75,900 a year for a trench landfill at site 12

A single County landfill located near Divide compares favorably to an entire County transfer system as being the most cost-effective solid waste management option in Teller County. The high waste volume operation present in a single County landfill, versus the operation of two smaller County landfills,

# TABLE 21

## COST SUMMARY OF SOLID WASTE MANAGEMENT ALTERNATIVES, TELLER COUNTY

### I. One Landfill (Serving the Entire County)

| Site | Amortized Capital* | Annual Operating Cost | Total Annual Cost+ |
|---|---|---|---|
| 12 | $24,700 | $51,200 (Trench) | $ 75,900 |
| | | 40,100 (Area) | 64,800 |
| 14 | 21,000 | 51,200 (Trench) | 72,200 |
| 17 | 21,000 | 51,200 (Trench) | 72,300 |
| | | 40,100 (Area) | 61,200 |
| 35 | 12,000 | 40,100 (Area) | 52,100 |

### II. Two Landfills (Serving the Entire County)

| Sites | | | |
|---|---|---|---|
| 12 & Cripple Creek | $29,300 | $73,400 (Trench at 12) | $102,700 |
| | | 64,000 (Area at 12) | 93,300 |
| 14 & Cripple Creek | 25,600 | 73,400 (Trench at 14) | 99,000 |
| 17 & Cripple Creek | 25,700 | 73,400 (Trench at 17) | 99,100 |
| | | 64,000 (Area at 17) | 89,700 |
| 35 & Cripple Creek | 16,600 | 64,000 (Area at 35) | 80,600 |

### III. Transfer of Waste to El Paso County (Entire County System)

| Method | | | |
|---|---|---|---|
| Collection Vehicle | $ 3,900 | $ 69,500 | $ 73,400 |
| Transfer Station | 11,800 | 58,200 | 70,000 |

### IV. Transfer of Waste to El Paso County (Northern Teller County) and Landfill (Southern Teller County)

| Method | | | |
|---|---|---|---|
| Collection Vehicle and Cripple Creek Landfill | $ 5,900 | $ 76,700 | $ 82,600 |
| Transfer Station and Cripple Creek Landfill | 14,800 | 74,800 | 89,600 |

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* Using an annual capital recovery factor (CRF) of 0.16275 to determine the uniform annual debt payment at an interest rate of 10 percent over 10 years.

+ Add $11,200 if the supplementary greenbox system (see Table 14) is used.

demonstrates an economy of scale. A single landfill would therefore be less expensive than two smaller landfills in both capital and operational costs. The 15 percent reduction in annual operating costs obtainable in operating a landfill for northern Teller County will not offset the added financial burden of operating a second landfill in Cripple Creek. If a northern Teller County landfill is operated, the County will have to spend an additional $26,800 to $28,500 (depending on the operation) each year to operate a landfill at Cripple Creek. If a single landfill is operated, however, waste transportation costs will increase, due to the longer haul distances involved.

To provide service to those residents in southern Teller County inconvienced by the closure of the Victor and Cripple Creek disposal sites, the County could provide greenbox stations in those areas and contract out the operation of the greenbox waste collection. The current added cost of providing this greenbox service would be approximately $6,600 a year (truck and greenbox costs). The expense of providing supplementary greenbox service to Cripple Creek, Victor, and Florissant would be $11,200 a year. This compared to the $34,500 required to operate an additional landfill at Cripple Creek.

The County could, at the added cost, continue to provide for operation of a landfill at Cripple Creek to supply service to the residents in that area. The upgrading and continued operation of the Victor disposal site however, does not at this time appear feasible. This site should be closed and waste disposal diverted to either the Cripple Creek landfill or to the future Divide landfill, depending upon the option chosen.

It should be emphasized that the County needs to purchase a piece of ground for solid waste purposes as soon as possible. This future planning decision applies no matter which alternative is chosen, landfilling or solid waste transfer. Because of the rapid consumption of land for development purposes (primarily second home development), areas in the County that might be suitable for a landfill will become unavailable if not set aside in the near future. The purchase of this land will also preserve the Teller County landfill option for the future when other disposal alternatives (like transfer) become much more limited in feasibility than they are at present.

At this time, regulations promulgated by the Colorado Department of Health (CDH) do not permit open burning at any landfill site in the State of Colorado. The incineration of solid waste can be approved only if the burning occurs in an "approved enclosure", or incinerator and is in compliance with ambient air quality standards set by the Air Pollution Control Division of the CDH. Towns and counties with small populations cannot receive variances from the State in order to burn solid waste.

It is apparent that the Victor disposal site presents real obstacles to the proper operation of a sanitary landfill. The further operation of a landfill at this site is not recommended due to the serious potential for surface water pollution, and the safety hazards associated with inadequate cover and fencing, and burning and blowing trash. Closure of this site will be difficult from an operational standpoint. Because trash is strewn down the side slope of a ravine, it will be difficult to apply final cover material to it. It is recommended that a trench be dug at the foot of the slope and the trash be bulldozed into it and covered. The angle of the ravine side slope should be reduced to at least 45 degrees so that any waste present on this land surface (which does not fit into the trench) can be covered.

## B. Transfer

The collection vehicle and transfer station transfer options (serving the entire County) rank with a single County landfill as being the least costly waste management systems in Teller County. Over the long-term, the transfer option poses somewhat of a disadvantage since it forces the County to remain dependent on the availability of other waste disposal operations within a reasonable proximity to the County. For Teller County, the transfer alternatives imply dependence on projected waste disposal capacity in the Colorado Springs region. Because of the depletion of landfill space in El Paso County, Teller County should closely examine any long-term decision involving transport of wastes to El Paso County. If additional long-term landfill space is located in El Paso County within a reasonable distance from Teller County, solid waste transfer will remain viable.

Solid waste transfer represents an option which would provide an equal level of service (as compared to landfilling) to area residents. For alternatives which serve the entire County,it would cost approximately $12.90 per ton of waste disposed for the collection vehicle system and $12.30 per ton of waste disposed for the roll-off container/transfer station system. Rising fuel costs would make either alternative, particularly the former, even more expensive, The total annual costs for the collection vehicle option and the roll-off/transfer station option would be $73,400 and $70,000 a year, respectively, for the entire County. If a northern Teller County transfer system is operated along with the Cripple Creek landfill, the annual costs translate to $82,600 (collection vehicle option) and $89,600 (transfer station option).

Vehement opposition to the extension of a permit for the major landfill (26th Street Landfill) in Colorado Springs prompted City and El Paso County officials to recently organize a task force to study solid waste disposal options other than landfilling. This joint City/County Task Force on Hazardous Materials and Resource Recovery has explored recycling and the incineration of waste. Although no decisions have been made at this time, El Paso County officials implementing future programs like incineration might welcome, for reasons of economic feasibility, the additional waste stream from Teller County. Although this option is not now available nor promises to be in the immediate future, Teller County officials should initiate a dialogue with El Paso County in order to keep this opportunity open. An incinerator in El Paso County could accept a portion of Teller County's waste and extend the useable life of a landfill in Teller County.

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# APPENDIX - A

# STATE OF COLORADO SOLID WASTE DISPOSAL SITES AND FACILITIES REGULATIONS

COLORADO DEPARTMENT OF HEALTH
4210 East 11th Avenue
Denver, Colorado 80220

REGULATIONS: SOLID WASTES DISPOSAL SITES AND FACILITIES

AUTHORITY: Chapter 36, Article 23, CRS 1963 (1967 Perm. Cum. Supp.) as amended by Chapter 103, Colorado Session Laws 1971.*

The following regulations were adopted by The Colorado State Board of Health pursuant to Colorado Revised Statutes 1963, Section 3-16-2 as amended**, and Chapter 36, Article 23, CRS 1963 (1967 Perm. Cum. Supp.) as amended by Chapter 103, Colorado Session Laws 1971, for the designation, operation, maintenance, and design of Solid Waste Disposal Sites and Facilities.

Adopted February 16, 1972

Effective Date April 1, 1972

Section 1. SCOPE These regulations shall be applicable to all solid waste disposal sites and facilities, whether designated by ordinance within the corporate limits of any city, city and county, or incorporated town or by the Board of County Commissioners in unincorporated areas.

Section 2. DEFINITIONS (1) The following definitions extracted from Section 36-23-1, CRS 1963, as amended***, shall apply when appearing in these regulations:

a. "Solid waste" means garbage, refuse, sludge of sewage disposal plants, and other discarded solid materials, including solid waste materials resulting from industrial, commercial and from community activities, but shall not include agricultural waste.

b. "Department" means the Department of Health.

c. "Approval site or facility" means a site or facility for which a "Certificate of Designation" has been obtained, as provided in this act.

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* Title 30, Article 20. CRS
** 24-4-102, CRS 1973
*** 30-20-101, CRS 1973

d. "Person" means an individual, partnership, private or municipal corporation, firm, or other association of persons.

e. "Solid waste disposal" means the collection, storage, treatment, utilization, processing, or final disposal of solid wastes.

f. "Solid waste disposal site and facility" means the location and facility at which the deposit and final treatment of solid wastes occur.

g. "Transfer station" means a facility at which refuse, awaiting transportation to a disposal site, as transferred from one type of collection vehicle and placed into another.

h. "Recyclable materials" means a type of material that is subject to reuse or recycling.

i. "Recycling operation" means that part of a solid waste disposal facility or a part of general disposal facility at which recyclable materials may be separated from other materials for future processing.

Definitions. (2) Other terms used in the statute or regulations are defined as follows:

a. "Certificate of Designation" means a document issued under authority of the Board of County Commissioners to a person operating a solid waste disposal site and facility of a certain type and at a certain location.

b. "Milling-tailings" are that refuse material resulting from the processing of ore in a mill.

c. "Metallurgical slag" is the cinder or dross waste product resulting in the refining of metal bearing ores.

d. "Mining wastes" are either mill-tailings or metallurgical slag or both.

e. A "Junk automobile" is defined to be the hulk or body of a motor vehicle essentially suitable only for one use as scrap metal. Junk automobile parts constitute the normally recyclable materials obtainable from a motor vehicle.

f. "Suspended solids" are finely divided mineral and organic substances contained in the sewage existing in a sewage system.

g. "Engineering data" shall mean information describing the area of disposal sites in acres, a description of the access roads and roads within the site, a description of fencing enclosing the disposal site, and overall plan listing the method or methods by which the disposal site will be filled with refuse and the use to which it will be placed once the site is filled and closed.

h. "Geological data" shall mean classes of soil to a reasonable depth from the ground surface, the location and thickness of the significant soil classifications throughout the area of the site and to extend some distance beyond the boundaries of the site, to include information on groundwater elevations, seepage quantities and water wells 1,000 feet beyond the boundary of the disposal site.

i. "Hydrological data" shall include average, maximum, and minimum amounts of precipitation for each month of the year, surface drainage facilities, streams and lakes adjacent to the disposal site, irrigation water ditches adjacent to the site, wells, streams and lakes.

j. "Operational data" shall include a plan for overall supervision of the disposal site to include supervisory personnel and labor personnel, equipment and machinery consisting of all items needed for satisfactory landfill operation, traffic control, fire control, cover material, working face, moisture content, compaction control, and rodent and insect control.

k. "Sanitary landfill" is the final disposal of solid waste on the land by a method employing compaction of the refuse and covering with earth or other inert material.

l. A "Composting plant" is a solid waste disposal facility utilizing biochemical degradation to change decomposable portions of solid waste to a humus-like material.

m. "Incineration" is the controlled combustion of solid, liquid or gaseous waste changing them to gases and to a residue containing little combustible material.

n. "Hazardous material and toxic substances" are liquid or solids which can be dangerous to man, animal and plantlife unless properly neutralized.

o. "Minimum Standards" (See Section 3) shall mean the requirements which shall be applied to all solid waste disposal sites and facilities.

p. "Engineering Report Design Criteria" (See Section 4) shall mean the minimum requirements which shall be applied to new facilities proposed for designation as a solid waste disposal site and facility.

Section 3. MINIMUM STANDARDS (1) (a) the following minimum standards are hereby adopted and incorporated herein as directed by Section 36-23-10 CRS 1963, as amended*:

(b) Such sites and facilities shall be located, operated, and main-

*30-20-110, CRS 1973

tained in a manner so as to control obnoxious odors, prevent rodent and insect breeding and infestation, and shall be kept adequately covered during their use.

(c) Such sites and facilities shall comply with the health laws, standards, rules and regulations of the Department, the Air Pollution Control Commission, the Water Pollution Control Commission, and all applicable zoning laws and ordinances.

(d) No radioactive material or materials contaminated by radioactive substances shall be disposed of in sites or facilities not specifically designated for that purpose.

(e) A site and facility operated as a sanitary landfill shall provide means of finally disposing of solid wastes on land in a manner to minimize nuisance conditions such as odors, windblown debris, insects, rodents, smoke, and shall provide compacted fill material, adequate cover with suitable material and surface drainage designed to prevent ponding and water and wind erosion; prevent water and air pollution and, upon being filled, shall be left in a condition of orderliness, good esthetic appearance and capable of blending with the surrounding area. In the operation of such a site and facility, the solid wastes shall be distributed in the smallest area consistent with handling traffic to be unloaded, shall be placed in the most dense volume practicable using moisture and compaction or other method approved by the Department, shall be fire, insect and rodent resistent through the application of an adequate layer on inert material at regular intervals and shall have a minimum of windblown debris which shall be collected regularly and placed into the fill.

(f) Sites and facilities shall be adequately fenced so as to prevent waste material and debris from escaping therefrom, and material and debris shall not be allowed to accumulate along the fence line.

(g) Solid wastes deposited at any site or facility shall not be burned, provided, however, that in extreme emergencies resulting in the generation of large quantities of combustible materials, authorization for burning under controlled conditions may be given by the Department.

## Section 4. ENGINEERING REPORT DESIGN CRITERIA

a. The design of a solid waste disposal facility hereinafter desingated shall be such as to protect surface and subsurface waters from contamination. Surface water from outside the immediate working area of the disposal site shall not be allowed to flow into or through the active disposal area. The design shall provide for the deflection of rain or melting snow away from the active area where wastes are being deposited. As filling continues to completion, the surface shall be sloped so that water is diverted away from the area where refuse has been or is being deposited. The design shall include methods of keeping groundwater out of the area where refuse is deposited.

b. The site shall be designed to protect the quality of water available in nearby wells. The necessary distance from the wells is dependent in part on the direction of flow of groundwater under the site and the means used in the design to prevent precipitation falling on the site from reaching the aquifer in question. Soil characteristics. The soil used for covering of landfill type operations shall have enough adhesive characteristics to permit a workable earth cover.

c. The location of the solid waste site and facility should provide for convenient access from solid waste generation centers.

d. The access routes shall be designed so as to permit the orderly and efficient flow of traffic to and from the site as well as on the site.

Traffic control routes on the site shall permit orderly, efficient and safe ingress, unloading and egress.

e. The design of the facility shall provide for effective compaction and cover of refuse materials in such a program as will prevent the emergence or attraction of insects and rodents.

f. Solid waste deposited at disposal sites and facilities shall be compacted prior to covering. Use of moisture or change of particle size to aid in compaction is recommended.

g. The design shall contemplate the location and construction of the disposal site and facililty in such a manner as will eliminate the scattering of windblown debris. All solid wastes discharged at the site shall be confined to the site and any material escaping from the active discharge area shall be promptly retrieved and placed in the active discharge area.

h. Recyling operations may be designed to operate at solid waste disposal sites and facilities, provided such recycling operations do not interfere with the disposal of other wastes and provided that such recycle operations are carried out without creation of a nuisance and rodent and insect breeding.

i. The design shall include such equipment and operational methods to prevent the burning of solid wastes at the site and to extinguish any fires.

j. Final Closure. Prior to closing a solid waste disposal site except for cause as set forth in Section 36-23-13 CRS as amended*, the final cover of the deposited solid wastes shall be graded to the elevations which shall be shown in the initial design. The cover shall be of such thickness and material as will prevent the entrance or emergence of insects, rodents, or odors. Such closure elevations shall be such as will provide for the diversion of rainfall and runoff away from the fill area.

k. A plan and method for protecting solid wastes disposal sites and facilities against damage from floods shall be a part of the engineering design.

Section 5. THE REPORT OF THE DEPARTMENT to County Commissioners or municipal officials, recommending approval or disapproval of the application, shall consist of a written and signed document made in accordance with criteria established by the Board of Health, Water Pollution Control Commission and Air Pollution Control Commission.

Section 6. OPERATION OF A SOLID WASTE DISPOSAL FACILITY

An operational plan for placing into operation the engineering design for the disposal site and facility is required.

Such a plan shall include the following information:

a. The name or titles of the person or persons who will be in charge of the disposal site and facility. Such name(s) shall be of person(s) having the responsibility for the operation as well as the authority to take all corrective action necessary to comply with the requirements of this Department.

b. The list of equipment to be used at the disposal site.

c. The hours of operation of the site.

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*10-20-112, CRS 1973

d. The fire fighting equipment or department available for extinguishing fires.

e. The frequency of cover of the deposited wastes.

f. The frequency of retrieval of windblown debris.

g. A contingency plan for eradication of rodents and insects.

h. Procedures for implementing other aspects of the design.

## Section 7. RESTRICTIONS OF OPERATIONS. CLOSING SITES

a. In the event a person applying for a Certificate of Designation does not wish to receive at his site all items defined in the statute as solid wastes, his application to the county commissioners for approval of designation shall set forth the limitations as to materials to be accepted at the site. If such site is thereafter designated, the owner shall erect at the entrance to such a site an appropriate design setting forth the items not receivable at such site.

b. If a person having a site officially designated wishes to close the site for any reason, he shall inform the county commissioners at least 60 days in advance of such closing and shall post a sign, readable from the seat of an entering motor vehicle, informing the public of his intent to close such site. Such site shall be considered officially closed upon receipt of an official notice from the county commissioners, provided such closing date shall be at least 60 days after the notice to the county commissioners and the posting as above set forth. Upon closing of the site, the owner shall post a notice that the site is closed and shall take reasonable precautions to prevent the further use of such site.

## Add Section 8. Notification of Violations of an Approved Engineering Design Report

(a) Whenever the Department determines that a solid waste disposal site is not being operated substantially in accordance with the criteria provided in the Engineering Design Report or these regulations, the operator shall be informed of the nature of the alleged violation by certified mail and within ten days from and after receipt of the letter of citation, he may request a variance from the Engineering Design Report by making Written application to the Department stating the grounds for such request.

(b) The Department shall either approve such request or schedule the matter for an administrative hearing. If the operator fails to request a variance, or the Department refuses to grant a variance after the hearing, the operator shall be deemed to be in violation of the law and these regulations and the "Certificate of Designation" shall be subject to suspension, revocation or injunction as provided in Sections 36-23-13 and 14, CRS 1963, as amended by Chapter 103, Colorado Session Laws 1971*. The Department shall pomptly report the action taken to the Board of County Commissioners.

(c) Any person aggrieved by the decision of the Department may request a hearing before the State Board of Health and shall be afforded his rights to judicial review as provided in Section 66-1-13, Colorado Revised Statutes 1963**.

Note: These regulations rescind and supersede soild waste regulations and standards adopted November 21, 1967. Effective January 1, 1968.

*30-20-112 and 113, CRS 1973

**25-1-113, CRS 1973

## PART 4
## GENERAL REGULATIONS

30-15-401. General regulations. (1) In addition to those powers granted by section 30-11-107 and by parts 1, 2, and 3 of this article, the board of county commissioners has the power to adopt ordinances for control or licensing of those matters of purely local concern which are described in the following enumerated powers:

(a) (I) To provide for and compel the removal of rubbish, including trash and garbage but not including weeds, brush, or other growing things in place, from lots and tracts of land within the county, except industrial tracts of ten or more acres and agricultural lands currently in agricultural use as that term is defined in section 39-1-103 (6) (a) (I), C.R.S. 1973, and from the alleys behind and from the sidewalk areas in front of such property at such time, upon such notice, and in such manner as the board of county commissioners may prescribe by ordinance and to assess the whole cost thereof, including five percent for inspection and other incidental costs in connection therewith, upon the lots and tracts from which such rubbish has been removed. The assessment shall be a lien against such lot or tract of land until paid and shall have priority over all other liens except general taxes and prior special assessments.

(II) To inspect vehicles proposed to be operated in the conduct of the business of transporting ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials and to determine, among other things, that any such vehicle has the following:

(A) A permanent cover of canvas or equally suitable or superior material designed to cover the entire open area of the body of such vehicle;

(B) A body so constructed as to be permanently leakproof as to such discarded materials;

(C) Extensions of sideboards and tailgate, if any, constructed of permanent materials;

(III) To contract with persons in the business of transporting and disposing of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials to provide such services, but in no event on an exclusive territorial basis, to every lot and tract of land requiring such services within the unincorporated area of the county or in conjunction with the county on such terms as shall be agreed to by the board of county commissioners. Nothing in this subparagraph (III) shall be deemed to preclude the owner or tenant of any such lot or tract from removing discarded materials from his lot, so long as appropriate standards of safety and health are observed.

(IV) To regulate the activities of persons in the business of transporting ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials within the unincorporated area by requiring each such person to secure a license from the county and charging a fee therefor to cover the cost of administration and enforcement and by requiring adherence to such reasonable standards of health and safety as may be prescribed by the board of county commissioners and to prohibit any person from commercially collecting or disposing of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials within the unincorporated area without a license and when not in compliance with such standards of health and safety as may be prescribed by the board;

(V) To do all acts and make all regulations which may be necessary or expedient for the promotion of health or the suppression of disease;

(VI) To require every person in the business of transporting ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials to and from disposal sites to have, before commencing such operations, in such motor vehicle a motor vehicle liability insurance policy or evidence of such policy issued by an insurance carrier or insurer authorized to do business in the state of Colorado in the sum of not less than one hundred fifty thousand dollars for the damages for or on account of any bodily injury to or the death of each person as the result of any one accident, in the sum of not less than one hundred fifty thousand dollars for damages to the property of others as the result of any one accident, and in the total sum of not less than four hundred thousand dollars for damages for or on account of any bodily injury to or the death of all persons and for damages to the property of others. Any liability for failure to comply with the requirements of this subparagraph (VI) shall be borne by the individual, partnership, or corporation who owns such vehicle.

(4) Paragraph (a) of subsection (1) of this section shall not apply to the transporting of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials which are collected by a city, county, city and county, town, or other local subdivision within its jurisdictional limits, provided every vehicle so engaged in transporting the discarded materials has conformed to vehicle standards at least as strict as those prescribed in subparagraph (II) of paragraph (a) of subsection (1). Such governing body shall not grant an exclusive territory or regulate rates for the collection and transportation of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials.

(5) Any provision of paragraph (a) of subsection (1) of this section to the contrary notwithstanding, the governing body of a city and county shall not be precluded from adopting ordinances, regulations, codes, or standards or granting permits issued pursuant to home rule authority; except that such governing body shall not grant an exclusive territory or regulate rates for the collection and transportation of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials.

(6) The board of county commissioners, or the governing body of any other local governmental entity, shall not issue or enter into a contractual agreement for the collection and transportation of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials in any area where a hauler or haulers are then providing service without first giving a six-month public notice to said hauler or haulers advising them of the intent to enter into said proposed contractual agreement. Said public notice shall be given in a local newspaper of general circulation in the area served

by said haulers.

(7) Notwithstanding any other provision of law, nothing in this section shall prohibit the providing of waste services by a private person, provided such person is in compliance with applicable rules and regulations, within the limits of any city, county, city and county, town, or other local subdivision if such service is also provided by a governmental body within the limits of such governmental unit. Such governmental body may not compel industrial or commercial establishments or multifamily residences of eight or more units to use or pay user charges for waste services provided by the governmental body in preference to those services provided by a private person.

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Source: Added, L. 79, p. 1144, § 1; (1)(a) amended and (1)(i) and (3) to (7) added, L. 80, pp. 744, 479, 746, §§ 7, 2, 7

# APPENDIX - B

# COLORADO DEPARTMENT OF HEALTH GUIDELINES FOR THE REVIEW OF SOLID WASTE DISPOSAL FACILITIES

# GUIDELINES FOR THE REVIEW OF SOLID WASTE DISPOSAL FACILITIES

The Resource Conservation and Recovery Act of 1976 requires individual states to form a solid waste management plan. The plan must encourage long-term regional disposal sites which promote resource recovery and minimize environmental impacts that endanger public health and safety.

The Solid Waste Act, Title 30, Article 20, Part 1, delegates regulatory authority between state and local agencies. A Certificate of Designation is required before an applicant can dispose of any solid waste [as defined in the Solid Waste Act: 30-20-101 (6)] on any site. The following guidelines suggest the minimum technical information usually required for review by the Division of Radiation and Hazardous Waste Control.

I. Alternative sites' feasibility

II. Size and expected life of site

III. Feasibility of resource recovery - technical and economic

IV. Describe projected site use after closure

V. Engineering geologic data (requires exploratory borings or trenches)

    A. It is recommended that the following data be evaluated to a depth of ten feet beneath the deepest natural or excavated surface on site.

    B. Unconsolidated overburden materials
        1. Soils classification - Unified Soils Classification System
        2. Soil thickness and areal extent
        3. Pertinent engineering properties: grain size distribution, atterburg limits, moisture density and compaction characteristics, permeability, etc.

4. Estimated volumes available for cover or liner material

C. Bedrock Materials
  1. Rock type, strike, dip and thickness of bedding, joint or fracture size and spacing, fracture filling material, permeability, rippability, etc.
  2. Estimated volumes available for liner or cover material

D. Geologic hazards on or adjacent to the site such as:
  1. Rockfall, landslide or debris and mudflow hazards
  2. Slope stability
  3. Faulting and folding
  4. Erosion potential
  5. Mine subsidence

VI. Engineering Hydrologic Data

A. Surface waters
  1. Proximate lakes, rivers, streams, springs or bogs
  2. Site location in relation to 100 year floodplain
  3. Size and slope of contributing drainage basins
  4. Design of diversion and catchment structures for a 25 year, 24 hour precipitation event
  5. Impoundment of contaminated runoff
  6. Background surface water samples

B. Groundwaters
  1. Depth to groundwater - seasonal variations
  2. Wells within one mile radius of site: depth of well, depth to water, yield, use, casing intervals
  3. Nearest points of groundwater discharge
  4. Background groundwater samples, as necessary
  5. Major aquifers beneath site

C. Surface and groundwater monitoring; plans for leachate collection and treatment.

VII. Operational Data for Solid Waste Disposal

A. Landfills

1. Location and construction details for access roads
2. Plans for waste recycling, as applicable
3. Names of persons in charge of site; having authority to take corrective action
4. Slope of fill surface must divert runoff from working face
5. Refuse cell size, type of construction, location and arrangement
6. Amount of cover and frequency of application to working face
7. Direction of prevailing winds: maximum and average velocities
8. Provisions for retrieval of windblown debris, on and off the site
9. Equipment and manpower retained on site
10. Compactive effort to be applied to refuse and cover material
11. Types of waste received and their segregation
12. Provisions to ventilate methane gas from completed landfill
13. Measures to prevent or contain insect and rodent infestations
14. Measures and equipment to extinguish or prevent fires
15. Hours of operation
16. Final fill surface contours
17. Thickness and compaction of final cover
18. Provisions for maintenance after closure
19. Program of records keeping

B. Potentially toxic industrial or mining solid waste disposal sites

1. All previously listed criteria, as applicable
2. Chemical concentrations of processing and waste solvents
3. Chemical concentrations of solid waste
4. Engineering designs for diversion structures, dams, liners, dikes, tailings or dump sites

5. Engineering designs for holding ponds containing solvents and solutions
6. Plans for ground and surface water monitoring and long-term site maintenance
7. Ultimate disposal of solid waste recycling plans, if applicable

These criteria are applied on a site-to-site basis in the review process. Applications containing this information will be reviewed more quickly and efficiently. Four copies should be provided to this Division for review.

# APPENDIX - C

## POTENTIAL LANDFILL SITE EVALUATION MAP

## POTENTIAL LANDFILL SITE EVALUATION*

| Site | Eliminating Factor |
|---|---|
| 1 | Visibility |
| 2 | Soils |
| 3 | Visibility |
| 4 | Access, size |
| 5 | Access |
| 6 | Soils |
| 7 | Haul distance, visibility |
| 8 | Availability |
| 9 | Adjacent land use |
| 10 | Availability |
| 11 | Visibility |
| 12 | **NONE** |
| 13 | Adjacent land use |
| 14 | **NONE** |
| 15 | Utility easement |
| 16 | Adjacent land use |
| 17 | **NONE** (Consolidated with site 18) |
| 18 | |
| 19 | Forest Service land |
| 20 | Adjacent land use |
| 21 | Visibility |
| 22 | Availability |
| 23 | Access, slope |
| 24 | Visibility |
| 25 | Adjacent land use |
| 26 | Forest Service land |
| 27 | Forest Service land |
| 28 | Adjacent land use |
| 29 | Adjacent land use, |
| 30 | Adjacent land use, visibility |
| 31 | Adjacent land use |
| 32 | Adjacent land use |
| 33 | Adjacent land use, access |
| 34 | Access |
| 35 | **NONE** |
| Cripple Creek Site | **NONE** |

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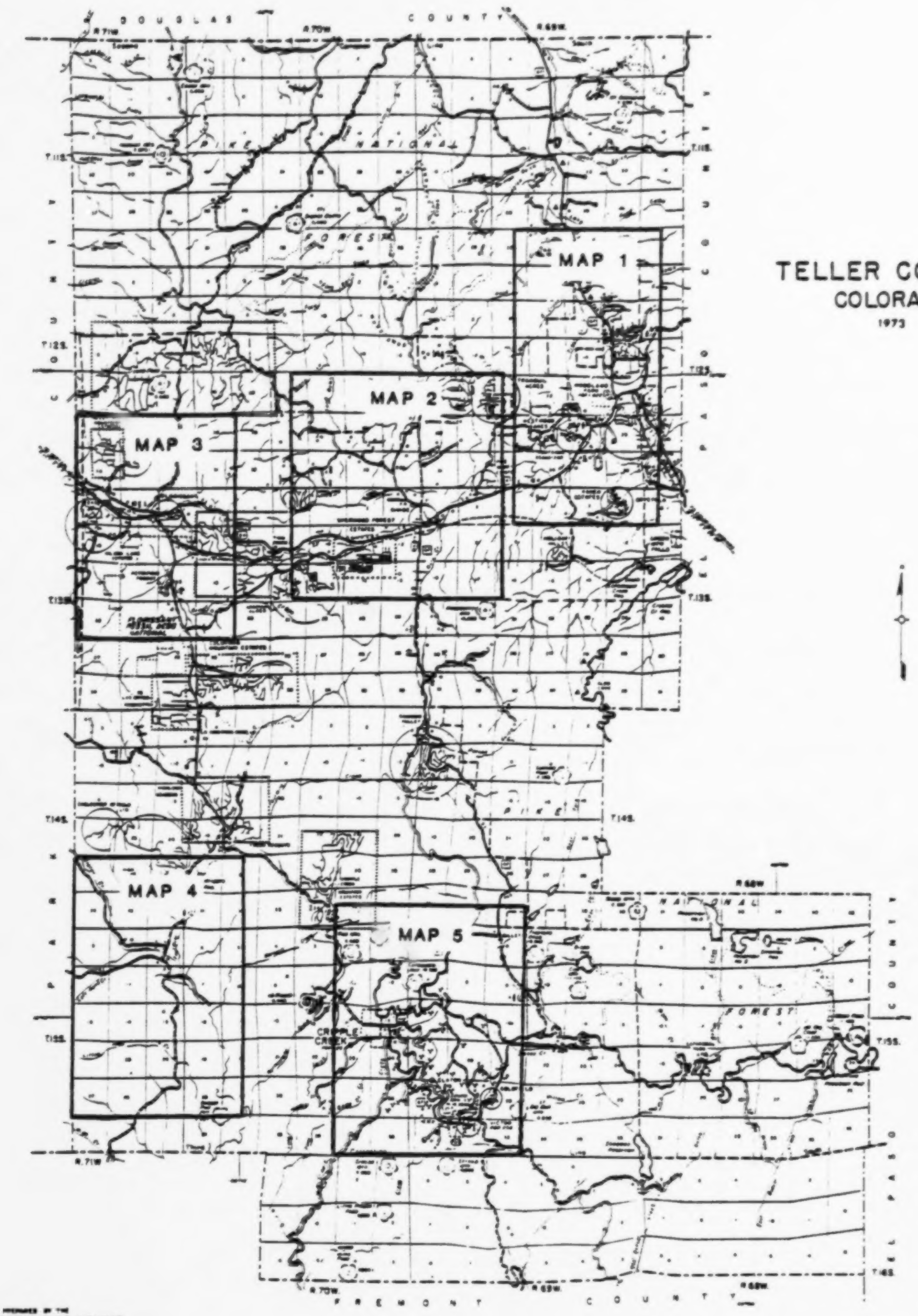
* The accompanying maps show the approximate location of the sites investigated. Eliminating factors are discussed in Section IV of the text, or are self-explanatory.

# INDEX TO POTENTIAL SANITARY LANDFILL SITE MAPS


DOUGLAS COUNTY
R.71W.
R.70W.
R.69W.
T.11S.
T.12S.
T.13S.
T.14S.
T.15S.
T.16S.
PIKE NATIONAL FOREST
PARK COUNTY
EL PASO COUNTY
MAP 1
MAP 2
MAP 3
MAP 4
MAP 5
R.68W.
CRIPPLE CREEK
FREMONT COUNTY

## TELLER COUNTY
### COLORADO
1973

PREPARED BY THE
STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS - STATE OF COLORADO
PLANNING AND RESEARCH DIVISION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

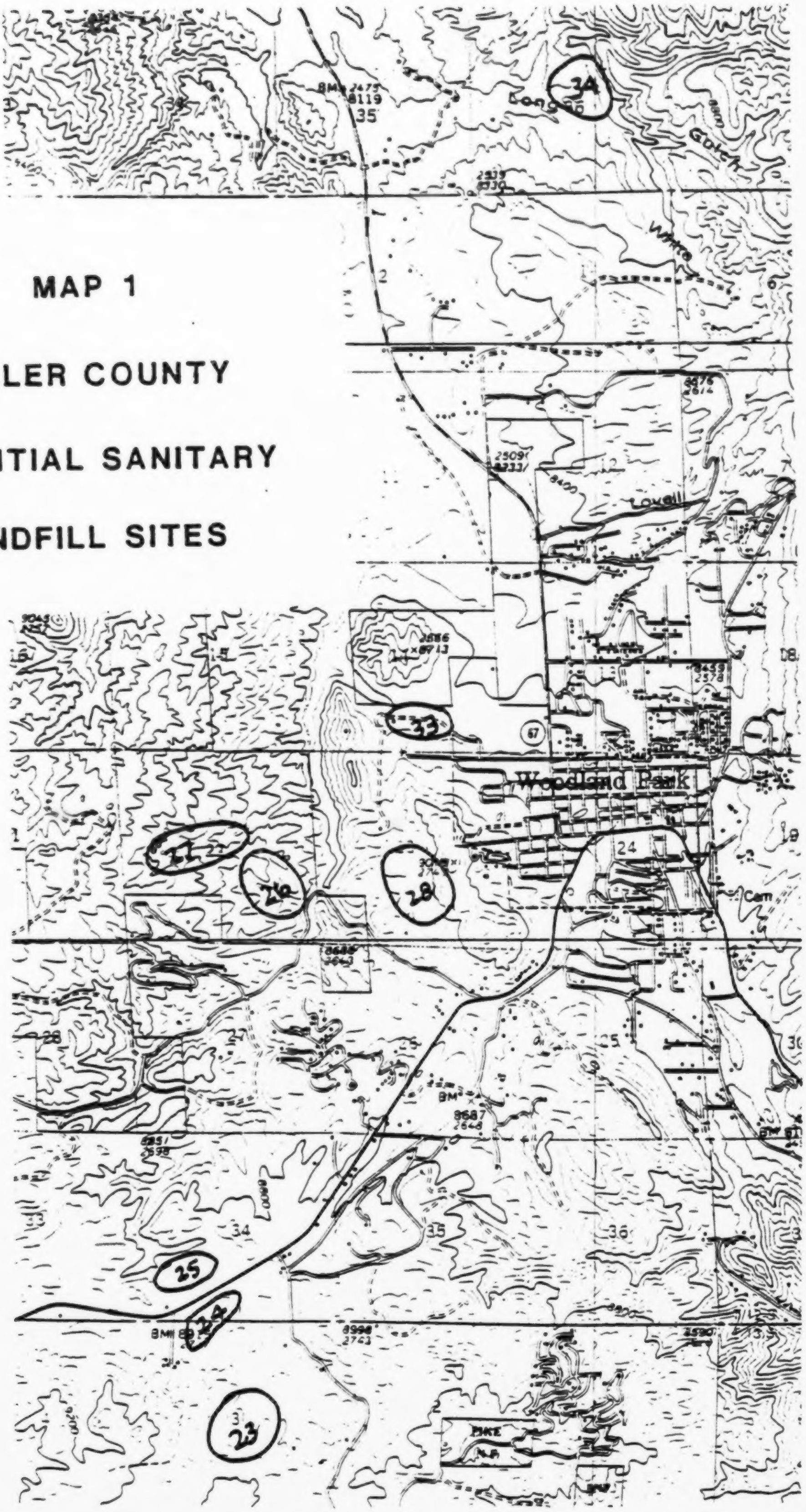
SCALE OF MILES

Reproduced from best available copy.

# MAP 1

# TELLER COUNTY

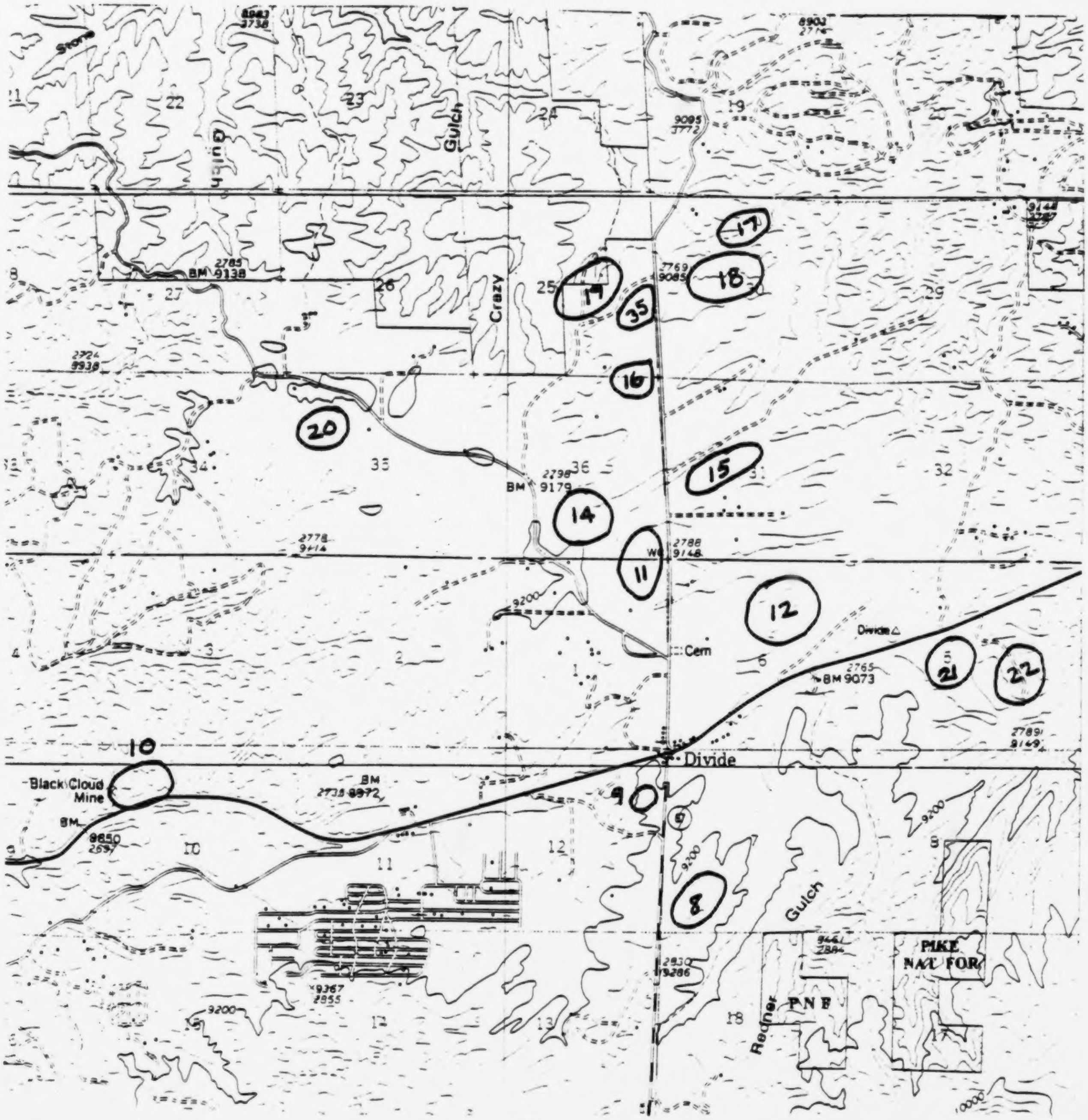
# POTENTIAL SANITARY LANDFILL SITES


34
Gulch
White
Lovell
33
Woodland Park
27
26
28
24
25
24
23
67

# MAP 2

# POTENTIAL SANITARY LANDFILL SITES

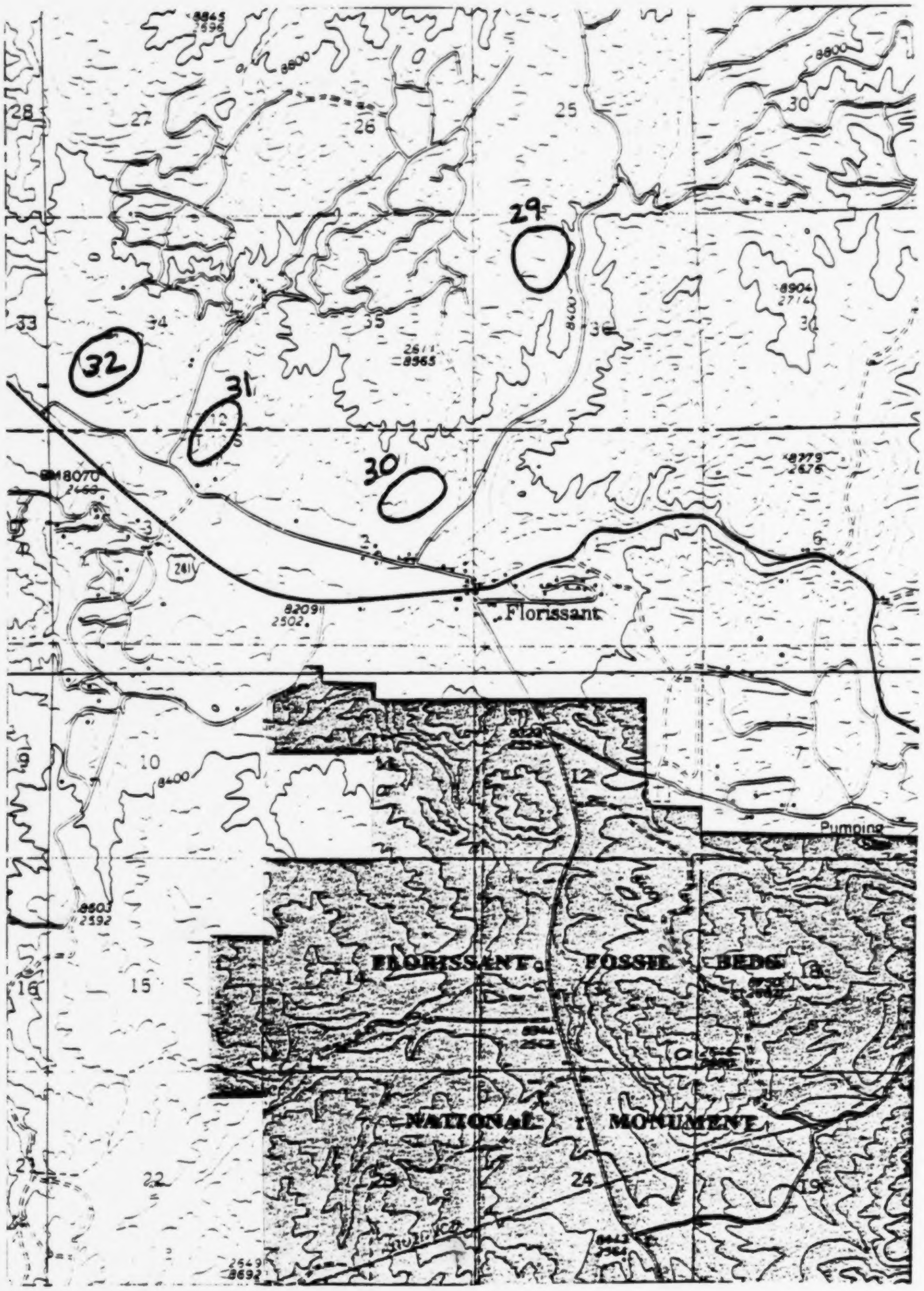
# TELLER COUNTY, COLORADO


17
18
19
35
16
20
15
14
11
12
21
22
10
9
8
Gulch
Crazy
Black Cloud Mine
Divide
Cem
Redner Gulch
PIKE NAT FOR
PNF
BM 9138
BM 9179
BM 9073
BM 8972
9200
10000

# MAP 3

# POTENTIAL SANITARY LANDFILL SITES

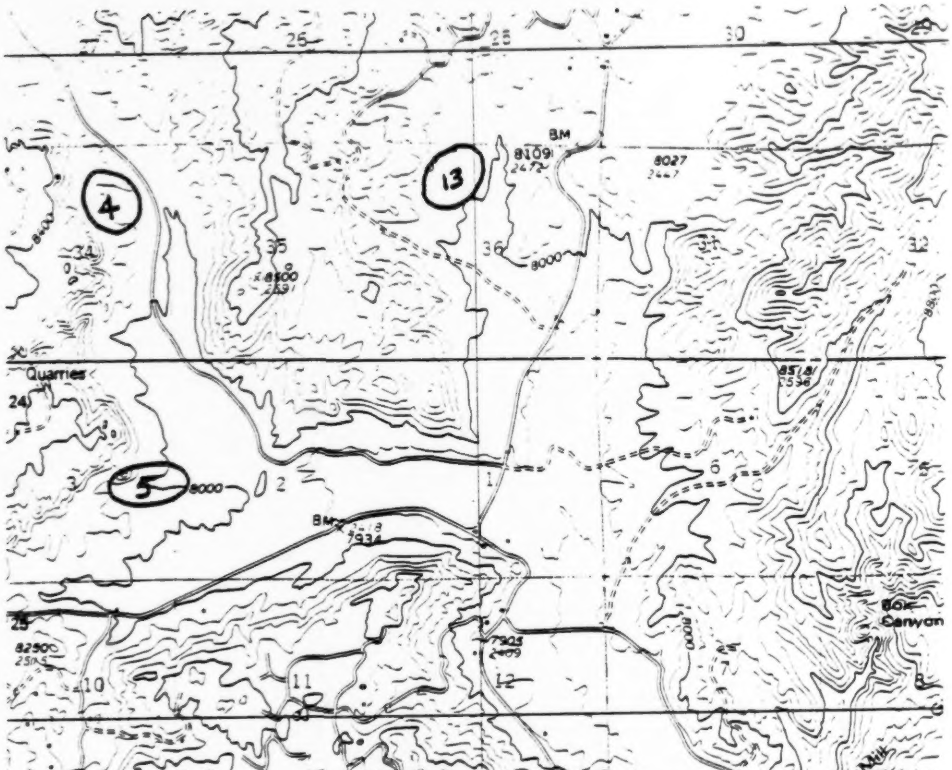
# TELLER COUNTY, COLORADO


29
30
31
32
Florissant
FLORISSANT FOSSIL BEDS
NATIONAL MONUMENT
Pumping
8800
8400
28
27
26
25
30
33
34
35
36
10
12
14
15
16
21
22
24

# MAP 4

# POTENTIAL SANITARY LANDFILL SITES

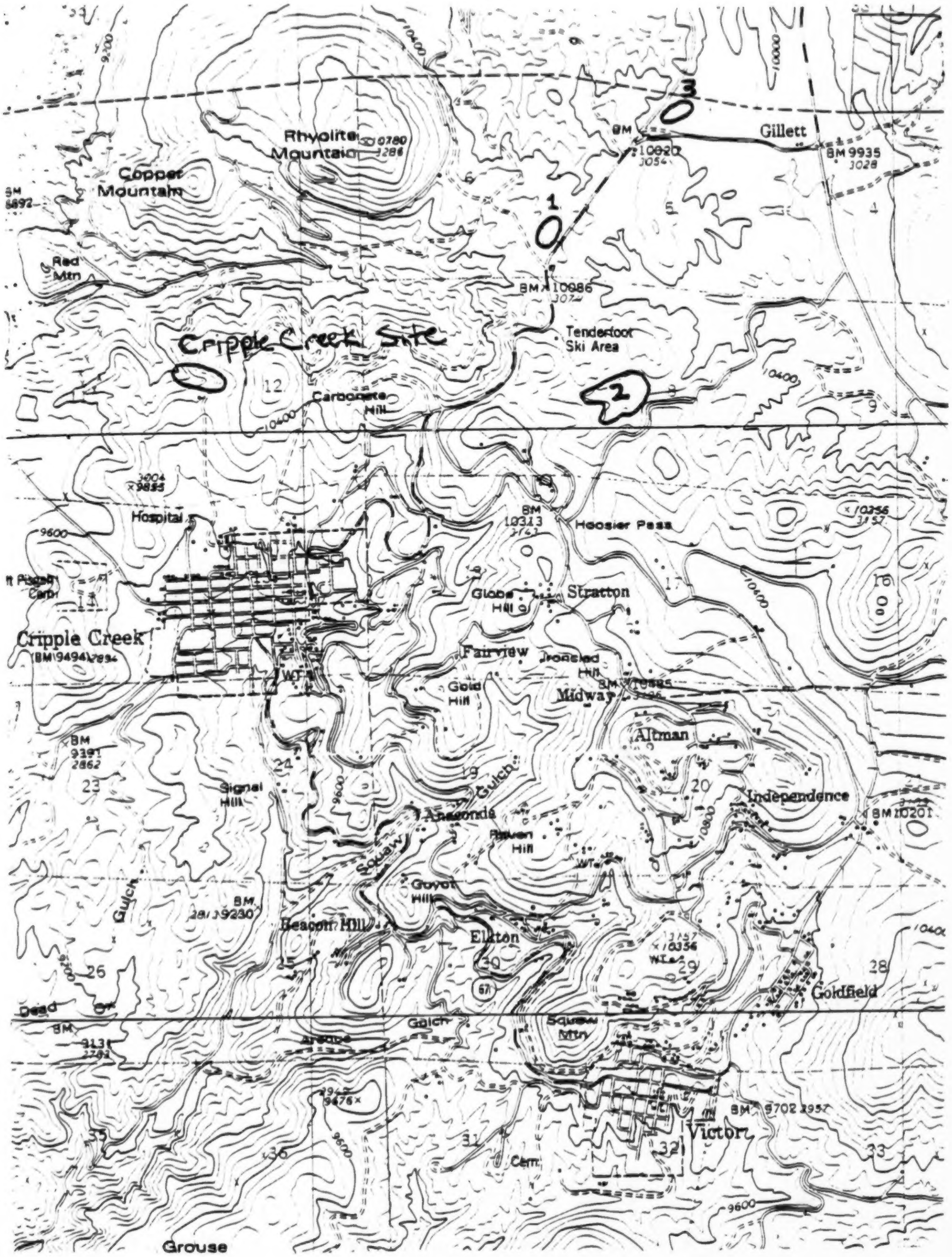
# TELLER COUNTY, COLORADO


4
13
5
6
7
Quarries
Box Canyon
High
Park
Booger
Hill
BM
8109
8027
8000
7934
7905
7711

# MAP 5

# POTENTIAL SANITARY LANDFILL SITES

# TELLER COUNTY, COLORADO


3
1
2
Cripple Creek Site
Rhyolite Mountain
10780
Copper Mountain
Red Mtn
Gillett
BM 9935
BM 10020
BM 10086
Tenderfoot Ski Area
Carbonate Hill
12
Hospital
Hoosier Pass
BM 10313
Globe Hill
Stratton
Cripple Creek
BM 9494
Fairview
Ironclad Hill
Gold Hill
Midway
Altman
Independence
BM 10201
Signal Hill
Anaconda
Gulch
Squaw
Raven Hill
Guyot Hill
Beacon Hill
Elkton
Goldfield
Squaw Mtn
Arequa
Gulch
Victor
BM 9702
Cem
Grouse
Dead
9600
10400

# APPENDIX - D

# SANITARY LANDFILL

# SAFETY

## SANITARY LANDFILL SAFETY CONSIDERATIONS

The nature of operations at landfill sites are such that the risk of accident/injuries, fires and health hazards are significant. The reduction of accident/injuries on the job means savings in time, money and equipment, not to mention reducing suffering and disability to members of the work force. the development and enforcement of a continuing safety program will help reduce the accident/injury potential at the landfill operation, thereby reducing the overall cost of the operation. Areas of concern should include but are not limited to:

**Individual Safety.** Personnel working at landfill sites should be familiar with the nature and hazards of the operation they are performing. Proper safety clothing and equipment should be used at all times. Examples of safety equipment are: safety shoes, shatter-proof glasses, heavy work gloves, chemically resistant work clothes, and hard hats.

**Fire.** Burning of wastes is not permitted at a sanitary landfill, but fires occur occasionally when there is careless handling of open flames and smoldering waste materials. The use of daily cover should keep fire in a cell that is under construction from spreading laterally to other cells. All equipment operators should keep a fire extinguisher on the their machines at all times since it may be necessary to put out a small fire. If the fire is too large, waste in the burning area should be spread out so that water can be applied. This is an extremely hazardous chore, and water should be sprayed on those parts of the machine that comes in contact with the hot wastes, A fire plan, for the landfill should spell out fire-fighting procedures and sources of water. All landfill personnel should be thoroughly familiar with these procedures. In the event a collection truck arrives carrying burning wastes, it should not be allowed near the working face of the fill but be routed as quickly as possible to a safe area away from buildings, where its load can be dumped and the fire extinguished.

**Traffic Control.** Traffic flow on the landfill site can effect the efficiency of daily operations. Haphazard routing in the area can lead to indiscriminate dumping and cause accidents. Pylons, barricades, guardrails, and traffic signs can be used to direct traffic. All vehicles hauling waste to the landfill should be of a closed type or have the means to properly secure the load to prevent the blowing or falling off of waste matter en route to the landfill. This requirement should apply to private vehicles delivering waste to the landfill site.

**First Aid.** First aid kits should be installed on all landfill vehicles and in the landfill office. All landfill operating personnel should be familiar with first aid procedures.

**Salvage and Scavenging.** Salvaging usable material from solid waste is laudable in concept, but it should be allowed only if a landfill has been designed to permit this operation and appropriate processing and storage facilities have been provided.

Scavenging, sorting through waste to recover salvageable items, must be strictly prohibited at the working face. Scavengers are too intent on searching to notice the approach of spreading and compacting equipment, and they risk being injured. Moreover, some of the items collected may be harmful, such as food waste, canned or otherwise, which may be contaminated.

**Firearms Control.** Landfill sites are usually located in areas wherein population density is light and areas surrounding or adjacent to the landfill are open country or farm land. These areas and the landfill site are likely to attract people interested in target shooting or small game hunting. Signs should be posted, outside the landfill boundaries, in all directions warning that hunting, target practice, or shooting of any type is not permitted within 300 feet of the landfill perimeter or on the landfill proper.

**Bird/Aircraft Hazards.** Birds that are sometimes attracted to landfill sites can be a nuisance, a health hazard, and a danger to low-flying aircraft. The primary method to reduce the problem is to make each working face as small as possible and to cover all wastes as soon as possible.

**Decomposition Gas.** Gas is produced naturally when solid wastes decompose. The quantity generated in a landfill and its composition depend on the types of solid wastes that are decomposing. Methane and carbon dioxide are the major constituents of landfill decomposition gas, but other gases are also present and some may impart a repugnant odor.

Landfill gas is important to consider when evaluating the effect a landfill may have on the environment, because methane can explode when present in air at concentrations between 5 and 15 percent. Since there is no oxygen present in a landfill when methane concentrations in it reach this critical level, there is no danger of the fill exploding. If, however, methane vents into the atmosphere (its specific gravity is less than that or air) it may accumulate in buildings or other enclosed spaced at dangerous levels close to a sanitary landfill.

The potential movement of gas is, therefore, an essential element to consider when selecting a site. It is particularly important if enclosed structures are build on or adjacent to the sanitary landfill or if it is to be located near existing industrial, commercial, and residential areas. Periodic checks of buildings on or adjacent to the landfill should be made.

Landfill gas movement can be controlled if sound engineering principles are applied. Permeable vents and impermeable barriers are the two most widely used methodologies.

**Communications.** Telephone or radio communication should be provided so that landfill operating personnel will be able to report fires or injuries. The use of a radio which can be tied into the Police network or the highway department should be satisfactory.

**Fencing.** Peripheral and litter fences are commonly needed at sanitary landfills. The first type is used to control or limit access, keep out children, dogs, and other large animals, screen the landfill, and delineate the property line. Litter fences are used to control blowing paper in the immediate vicinity of the working face. As a general rule, trench operations require less litter fencing because the solid waste tends to be confined within the walls of the trench. At a very windy trench site, a 4 foot snow fence will usually suffice. Since the location of the working face shifts frequently, litter fences should be movable.

# APPENDIX - E

# SOLID WASTE FACILITY FINANCING OPTIONS

# APPENDIX E

## SOLID WASTE FACILITY FINANCING OPTIONS

Solid waste collection and disposal entails such capital costs as land, equipment, and site improvements. Operating costs include salaries, utilities, fuel, site and equipment maintenance, and administrative costs. Several methods of funding solid waste systems are available, and the following discussion considers the advantages and disadvantages of current revenue ("pay-as-you-go") financing, long-term borrowing, leasing, and government grant and loan utilization. The applicability of the methods to the small community will be examined.

### CURRENT REVENUE FINANCING

Current revenue financing employs a sales tax, property tax, special assessment tax, or a combination of the above, and is based on the "pay-as-you-go" philosophy. The advantage of using current revenues is its simplicity---few informational, analytical, institutional, or legal arrangements are required. The general tax fund often cannot provide enough money to meet capital costs, but it is frequently used to help meet operating costs. An advantage in using the general fund for supplying operating expenses is that administrative procedures and the extra cost of billing and collecting are eliminated.

Solid waste management is commonly regarded as a low priority when general funds are apportioned, resulting in an insufficient budget and inadequate administration. Due to the lack of large amounts of available money in the general fund, another source of financing, such as long-term borrowing, is often necessary for financing capital costs. A disadvantage in using current revenues for capital expenditures is that tax revenues lag behind needed public services. For areas experiencing rapid growth, this places an inequitable burden on the present population.

In regard to special assessments, some states (including Colorado) have enacted legislation enabling the Board of County Commissioners to levy a special property tax to be deposited in a County fund for use in operating a solid waste system. This funding mechanism is provided by Title 30, Article 20 - Part 1, Solid Waste Disposal Sites and Facilities, Section 30-20-115. The legislation states:

> "Any county is authorized to establish a county solid waste disposal site and facility fund. The board of county commissioners of such county may levy a solid waste disposal site and facility tax, in addition to any other tax authorized by law, on any of the taxable property within said county, the proceeds of which shall be

> deposited to the credit of said fund and appropriated to pay the cost of land, labor, equipment, and services needed in the operation of solid wastes disposal sites and facilities. Any county is also authorized, after a public hearing, to fix, modify, and collect service charges from users of solid wastes disposal sites and facilities for the purpose of financing the operations at those sites and facilities."

Certain states also permit the formation of solid waste disposal districts, for the purpose of property taxation. No solid waste disposal districts have yet been formed in Colorado. Presently, there is an effort in Yuma County, Colorado to establish a solid waste disposal district. A 1953 Colorado statute provides for setting up solid waste disposal districts. County and municipal officials in Yuma County have, however, found problems with this statute since districts can be formed that cover only the unincorporated areas within a County. The formation of districts in unincorporated areas is somewhat impractical because waste generation is concentrated in the incorporated areas. Also, the statute limits taxing to 1/2 mill, an amount that is thought to be too small. An effort is underway to determine if a solid waste disposal district can be set up under other statutes for special purpose districts or to change the Colorado law.

Charges levied on the users of the collection and disposal system are another source of funds for the "pay-as-you-go" method of financing. User fees are a means of obtaining operating revenue, but they may also be used to generate funds for future capital expenditures. Fees must be periodically updated, to provide a fair and viable source of income.

For small communities experiencing rapid increases in population, the "pay-as-you-go" method forces present citizens to pay for future demands. A straight user fee would place too large a burden on the present population. If waste generation surges general fund contributions or another form of financing can be used to pay for initial costs. Future user charges can then be used to cover annual operating expenses and debt amortization.

## LONG-TERM BORROWING

Long-term borrowing is a common method of financing the capital costs of solid waste systems. Typical instruments are the revenue bond and the general obligation bond.

Revenue bonds are tax-exempt obligations that pledge user fees to guarantee repayment of the debt's principal and interest. In this case, fees must be charged to landfill users in amounts necessary to cover all capital and operating expenses. Revenue bonds and associated user fees are attractive because the producer of solid waste pays the true cost of its disposal. Also, voter approval is not necessary.

A possible disadvantage to consider is that a feasibility study of the project to be financed is required, which may be expensive. Revenue bonds are generally used to finance a single project, and the effective minimum size offering is normally greater than that of a general obligation bond. For a small, single community, revenue bond financing is often uneconomical.

General obligation bonds are the most commonly used instrument for financing capital outlays. They are tax-exempt obligations secured by the full faith and credit of a political jurisdiction which has the ability to levy taxes. Because the real estate taxes of the jurisdication are usually pledged, the bond is less risky and more marketable than a revenue bond. General obligation bonds also do not require a detailed feasibility study of the proposed project, and offer the lowest interest rates of any financial instrument.

However, state legislation usually limits the amounts of debt a community can incur. This could restrict or rule out the use of a general obligation bond, if a community is already liable for a substantial debt. If the bond is retired with revenues generated by the landfill operation, the amount of ad valorem taxes necessary for bond retirement is minimized.

## LEASING

Another option to consider is leasing. The local government rents the use of an asset (land, mobile equipment, etc.) which has been purchased by a third party. The government can in turn lease to a private operator.

An advantage to leasing is the postponement and spreading out of cash payments, therefore lessening the demand on initial capital outlays. In this regard, leasing may be a useful option for financing systems to be used by areas experiencing high population growth. Less legal work is usually involved than for other types of financing, and generally voter approval is not required.

Leasing is more expensive than long-term, tax-exempt bonds. At the expiration of the lease, the local government will not own or control the machinery or land leased, unless the contract specifies leasing with an option to buy. If municipal credit is poor or bonds can't be issued, leasing may be the most viable option.

## GRANTS AND LOANS

Financial assistance through federal, state, and regional entities is a method of supplementing other types of financing. The Farmer's Home Administration (FmHA) is authorized to provide financial assistance to public entities, in the form of grants and loans, for waste disposal facilities in rural areas and towns with a population less than 10,000. To be eligible, the applicant must be unable to obtain credit or financing from other sources. Priority is placed on areas with a population less than 5,500.

According to FmHA authorities, however, grants and loans have not been provided for solid waste disposal in Colorado in the past ten years. Funds are not expected to become available in the near future. Additional information may be obtained by contacting the county or district office of the FmHA.

The Environmental Protection Agency is another potential source of funding. The Resource Conservation and Recovery Act authorizes funding through the Solid and Hazardous Waste branch, for technical assistance in state level planning studies for solid waste management. The act also authorizes funding of regional and local government projects. However, funds have not been provided at the state or local level. The EPA has indicated that funds for solid waste assistance are not currently available, and no immediate change is expected in that status.

At the state level, Colorado Health Department authorities have stated that no grants or loans are presently available for planning or operating solid waste projects. For public entities which qualify, socio-economic impact funds, provided by the State of Colorado, may be available. The state monies, generated by federal lease royalties and severence taxes, are delegated to counties and municipalities for use on designated projects. Further information may be obtained by contacting the Socio-Economic Impact Office of the Colorado State Department of Local Affairs. In general, the probability of receiving state or federal aid for financing solid waste systems appears to be extremely low.

The previously described methods of financing are intended to provide a broad overview of techniques available. This description is not comprehensive, as other less common methods, and creative combinations of the described methods, may result in viable financing alternatives. It is recommended that professional financial consultants be utilized to model a financial plan, when the solid waste system is ready to be implemented.

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# APPENDIX - F

# LANDFILL CALCULATIONS

# LANDFILL CALCULATIONS

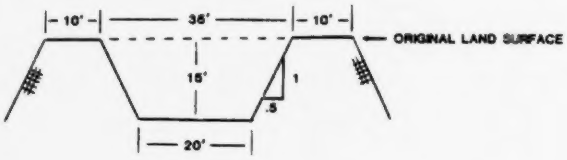
## 1. Compacted Waste Density

= 1,000 lb./yd.$^3$

## 2. Trench Volume

1 ft. x .5 x (20 ft. + 35 Ft.) x 15 ft.

= 412.5 ft.$^3$



## 3. Trench Volume Per Linear Foot

412.5 ft.$^3$ ÷ 27 ft.$^3$/yd.$^3$

= 15.3 yd.$^3$/ft.

## 4. Annual Required Trench Length

5,680 tons x 2 yd.$^3$/ton (or 1,000 lb./yd.$^3$)

= 11,400 yd.$^3$ (Volume of Waste Per Year)

at 1:4 cover to refuse ratio:

11,400 yd.$^3$ x 1.25

= 14,200 yd.$^3$ (Volume of Waste and Cover Per Year)

14,200 yd.$^3$ ÷ 15.3 yd.$^3$/ft.

= 930 ft./year of trench

5. **Annual Required Landfill Acreage (Trench Method)**

Width = 35 ft. (trench) + 10 ft. (space) = 45 ft.

Length = 930 ft.

Area = 45 ft. x 930 ft./year = 41,900 ft.$^2$/year

Conversion (ft.$^2$ to acres) = 41,900 ft.$^2$/43,560 ft.$^2$/acre

= .96 acre/year

6. **Annual Required Landfill Acreage (Area Method)**

(12 ft. cell depth x 43,560 ft.2/acre x 0.8 cover requirement)

÷ 27 ft.$^3$/yd.$^3$

= 15,500 yd.$^3$/acre

11,400 (waste) ÷ 15,500 yd.$^3$/acre = .73 acre/year

7. **Annual Cover Requirement (Cripple Creek Landfill)**

3,300 yd.$^3$/year (waste) x .20 (cover)

= 660 yd.$^3$/year

# APPENDIX G

## COLORADO DEPARTMENT OF HEALTH RECOMMENDATIONS FOR THE UPGRADING OF THE CRIPPLE CREEK LANDFILL

**COLORADO DEPARTMENT OF HEALTH**

Richard D. Lamm
Governor

Frank A. Traylor, M.D.
Executive Director

January 11, 1982

Teller County Health Services
P.O. Box 118
Woodland Park, Colorado 80803

Attention: Mr. Lane Wyatt

Gentlemen:

As requested by Mr. Wyatt, we have attempted to summarize our concerns and recommendations regarding the operation of the Victor and Cripple Creek Landfills, in Teller County, Colorado. This information is intended to enable the Teller County Health Services Department and the Teller County Commissioners to revise the operation of these facilities such that they conform to the regulations of the Solid Waste Disposal Sites and Facilities Act, C.R.S. 1973, 30-20 Part 1, as amended.

A. Victor Landfill

Recent inspections performed on the Victor landfill have shown many problems with this facility. The major areas of non-compliance are:

1. Inadequate and irregular cover has been placed.
2. There is inadequate fencing to control access and windblown debris.
3. Burning was occurring during each inspection.
4. Not designated in accordance with the Solid Waste Act.
5. Potential safety hazards may exist due to burning and subsidence.

Many of the items listed above would be prohibitively expensive to correct in order for this facility to comply with the State's rules and regulations. Therefore, in our opinion the continued operation of this landfill does not seem feasible and it should be closed. A collection box transfer station which is hauled to the Cripple Creek landfill is an alternative which may be feasible,

4210 EAST 11TH AVENUE DENVER,COLORADO 80220 PHONE (303) 320-8333

B. Cripple Creek Landfill

1. Solid waste is being burned at this facility in violation of the Solid Waste Regulations.
2. Solid waste is not being covered on a regular basis.
3. There are no provisions to either direct runoff away from the landfill and/or contain liquids which may be emitted from the landfill.

In our opinion relatively minor modifications are necessary to upgrade this facility so that it can be designed and operated in accordance with the State's Rules and Regulations. The modifications are:

1. The burning of solid waste must be stopped.
2. The existing solid waste must be spread and covered. Any future waste should be compacted and covered so as to minimize the amount of windblown debris. A monthly application of cover material should suffice for this facility. However, if litter problems become evident, weekly cover should be considered.
3. Rather than attempting to divert the minimal surface water flow from entering the landfill, the County may want to construct a small catchment basin in the drainage below the fill. The basin should be located and constructed such that it could collect and evaporate any liquids which flowed from the fill.
4. Due to the fractured nature of the bedrock strata beneath this facility it should not be allowed to accept liquids of any kind.

We regret any delays on these projects which may be attributed to miscommunication with this office. It has been and still remains our intent to provide Teller County with as much clear, concise, technical assistance and guidance as possible. If this letter does not meet your requirements please contact us so that we may try again.

Sincerely,

Dennis C Hotovec
Dennis C. Hotovec
Project Geologist

Kenneth L. Waesche
Kenneth L. Waesche
Acting Director
WASTE MANAGEMENT DIVISION

DCH:KLW:pb

cc: Teller County Commissioners